American Machinist

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Models of '38—Detroit shops are stocking dealers against public response to next week's Auto Show

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THE PUBLISHERS

More production men pay to read American Machinist than any other metal-working paper

EDITORIAL

Alternatives

NEW DEAL legislation already passed has stimulated labor organization beyond the hopes of the most optimistic of the labor leaders. Mr. Roosevelt promises that there is more legislation to come. Whether the President is able to fulfill his promise or not, the employer faces a cost problem that he is meeting as best he can.

Labor cost is the major expense item in almost every industrial product. Raise it and you raise the cost of the product, and therefore its selling price, unless the maker finds some way to reduce other costs to offset increased labor cost. One way to do this is to lay off men as the railroads are doing to keep their total payrolls down. It is hard to see how service standards can be maintained unless traffic falls off. If standards fall too much the consuming public will turn to some other means of transportation.

An alternative that is being used by manufacturers is intensive study of product designs and manufacturing operations to see what changes can be made to reduce costs. A combination of these two factors is exemplified in the application of welding to the fabrication of large electrical equipment. Many operations have been cut out entirely. Much less equipment is needed. Two excellent papers presented at the recent Erie meeting of the American Society of Mechanical Engineers described this method of reducing costs as practised by the General Electric Company.

Another alternative is the installation of modern equipment to multiply the effectiveness of the individual operator. In other words, the workman can earn more with adequate tools, and can therefore be paid more. There is no other way of achieving the New Deal objective of the more abundant life for the wage earner. Boosting his wages without increasing his production efficiency results only in raising the cost of everything and leaving him no better off than he was before. As a matter of fact he is less well off because the export market for what he makes is narrowed and there is therefore less work for him to do.

LABOR LEADERS and the Washington administration apparently find it hard to grasp the simple fact that the purchasing power of wages can only be raised if the wage earner produces more in proportion. Until they do grasp it there will be no more abundant life for anyone. In the meantime industry will have to improve its methods and modernize its facilities as best it can in order to keep going despite the handicaps that surround it. The alternative is catastrophe that will engulf all of us.

Plant Rehabilitation Only Started

Estimate shows that the percentage of old machine tools has been reduced but slightly since 1935

JOHN HAYDOCK
Managing Editor, American Machinist

IN 1935 *American Machinist* took a count of metal-working equipment rated according to age. The result showed that of 1,345,447 machine tools in use by American industry, 65 per cent were over ten years of age.

Previous surveys gave corresponding percentages of 44 in 1925 and 48 in 1930. Thus, during a period that has often been classed as normal for statistical purposes, less than half of the machine tools in place were over the ten-year mark.

The 1935 figure showed a sudden jump in the percentage of old equipment in use. At the beginning of that year, nearly two-thirds of the machine tools had exceeded a ten-year vintage. In view of the low volume of equipment purchased during the depression period, this marked increase in the ratio of old to new machines is understandable. It was recognized, however, that this figure represented a high degree of obsolescence in the physical condition of metal-working plants that would be tolerated only temporarily. It was expected that any upturn in business conditions generally would see a strong demand for new machine tools.

Orders Have Tripled

We know that this demand has materialized. During the years 1930 to 1934 inclusive, the index of machine tool orders as compiled by the National Machine Tool Builders Association averaged only 41 based on the average monthly shipments during 1926. In 1932 the index averaged only 19.6 establishing an all-time low since records had been kept.

Since the *American Machinist* survey was compiled in 1935, the volume of orders has advanced rapidly. In the 2½ years that have elapsed between January 1, 1935, and July 1, 1937, the index has averaged 131, well over three times the level of the preceding five years.

As the surveys have been made at five-year intervals, July 1, 1937, marks a halfway point. It is timely, therefore, to take stock of the progress that has been made during this period and in so far as possible to make an estimate of the condition of American metal-working equipment today.

Progress During Recovery

It is impossible to say for certain just where an economic cycle begins and ends, but it is a fair assumption that the closing of 1934 marked the end of the depression. On this premise an estimate of the improvement in condition during the past 2½ years will be a measure of the progress that has been made in modernization during the recovery period.

It might be thought that the greatly increased activity in machine tool replacement would have gone far in reducing the percentage of old equipment and in bringing the ratio back to somewhere near the level reported at the beginning of 1930. The estimate does not bear this out. It indicates that the 65 per cent of machine tools over ten years old has been reduced only to 61 per cent as of July 1. A little later the method of arriving at this figure will be described.

It may be wondered why the gain has been so slight in view of the fact that the machine tool industry has been working practically at capacity during 1937. The answer seems to be that replacement of obsolete equipment was deferred for too long a period to permit making up the lost ground in so short a time.

In the report that accompanied the 1935 Inventory of Metal-Working Equipment, it was estimated that the machine tool industry would have to operate on an index level of 107.3 over a five-year period to maintain

Estimate of Percentage of Machine Tools Over Ten Years Old as of July 1, 1937

Total Units in Place — *AM* 1935 Inventory†	1,252,909
Over 10 Yrs. Old — *AM* 1935 Inventory	835,401
Less than 10 Yrs. Old — *AM* 1935 Inventory	417,508
Machine Tools Built — 1935 Census	45,735
Installed: Jan. 1, 1935–July 1, 1937*	140,300
Installed: Jan. 1, 1925–July 1, 1937	557,808
Machine Tools Built — 1925 Census	33,232
Installed Jan. 1, 1925 — July 1, 1927*	65,600
Less than 10 Yrs. Old — July 1, 1937	492,208
Over 10 Yrs. Old — July 1, 1937	760,701
Percentage of Old Units — July 1, 1937	61
Percentage of Old Units — Jan. 1, 1935	65

† Corrected to make comparable with Census figures.
* Estimated from Census of Manufactures by using N.M.T.B.A. indexes and allowing for foreign sales.

its ratio of 65 per cent of old equipment and would have to step up activity to 179 in order to regain its lost ground and bring the percentage back to 48 as reported in 1930. During the 2½-year period that has intervened the industry actually operated at a point (131) between these two levels. It has, therefore, gained some ground and has come back part way.

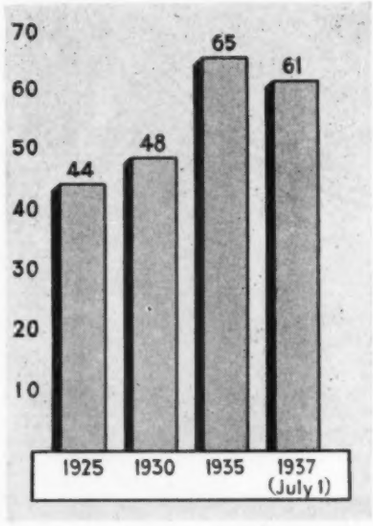
The machine tool index of orders was 86 per cent for 1935. In 1936 it was 136.6 and during the first six months of 1937 it averaged 210. If the level recorded during the first half of 1937 is continued through the last half of this year and through the years 1938 and 1939, the overall average for five years will be 170.5, still somewhat under the estimated index required to restore the 1930 ratio.

How Estimate Was Made

The estimate of the present status of old machine tools in place was made as follows: The machine tools built during 1935 were reported by the Census of Manufacturers. From this was deducted a percentage for machines shipped abroad, leaving those built for installation within the United States. This figure for 1935 was extended for 1936 and the first half of 1937 by applying the ratio of the Machine Tool Builders' index during 1935 to that reported for the later periods. In this way, it was possible to arrive at an approximation of the new equipment installed during the 2½-year period.

This figure was added to that reported for the new machines in place as of January 1, 1935, as shown in the *American Machinist* inventory. However, during this 2½-year period, there were a number of machines reported as new in 1935 which passed over the ten-year mark. These machines were those installed between January 1, 1925 and July 1, 1927. Accordingly, a similar estimate of the machines installed during this 2½-year period was made in the same manner. The Census of Manufactures for 1925 was used as a basis and was modified by the Machine Tool Builders' index in order to secure he number of machines installed over the period in question. When this figure was found it was deducted from the sum of the new machines as already computed, to give an estimate of the new machines in place as of July 1, 1937.

Having obtained this figure, the question arose as to whether these machines were installed as replacements or as additional equipment for



expansion. A knowledge of the industry would lead to the assumption that by far the greater portion of these machines was installed as replacements. In some cases, one machine replaced two or more others, which tended to reduce the total number in use. This substitution of a more efficient machine for several older ones would tend to balance other units installed for purposes of expansion. Therefore, for the purposes of this estimate, it was assumed that the total number of machine tools in place was constant over the 2½-year period. Further assurance for such an assumption was gained by the fact that there was only a slight change in the total number of units in use between the 1930 inventory and that for 1935.

Comeback Is Slow

The new machines as computed were then deducted from the total units in place to obtain a figure for the old equipment. From this figure the percentage was taken which came to 61 per cent as previously noted. Some of these figures involved in this computation are given in the accompanying table. In order to carry this estimate still further certain groups of machines were selected in order to see what progress had been made in replacement and to compare the percentages reported for them with those obtained by actual count 2½ years ago. These groups are also shown in a table, and as might have been expected there is a considerable variation in the results obtained. While most of the groups show a smaller percentage of old units than was reported in 1935 a few are in a less favorable position. This affords further proof that although the metal-working industry has made a fair start in bringing its physical plants up-to-date, there is still much to be done and much lost ground to be gained. The length of time it takes to rehabilitate the metal-working industry emphasizes the limitation under which the country would be placed should a national emergency arise. It points to the necessity of maintaining active modernization programs at a high level in order to put plants on an efficient basis for peace time operation and in readiness for national defense.

Estimated Machines Over Ten Years Old in Certain Classifications

	Automatic Lathes	*Turret Lathes*	*Engine Lathes*	*Horizontal Boring Machines*	*Milling Machines*	*Shapers*	*Surface Grinders*	*Tool and Cutter Grinders*
Total machines *AM* 1935 Inventory	22,138	56,299	126,596	14,267	78,449	27,488	20,401	37,167
Over 10 Yrs. Old *AM* 1935 Inventory	11,888	38,699	94,922	9,711	53,870	20,392	11,430	24,763
Less than 10 Yrs. Old *AM* 1935 Inventory	10,250	17,600	31,674	4,556	24,579	7,096	8,971	12,404
Reported Built — 1935 Census	1,166	994	2,567	321	1,398	386	1,110	575
Installed: Jan. 1, 1935–July 1, 1937*	3,575	3,050	7,868	983	4,283	1,182	3,403	1,764
Installed: Jan. 1, 1925–July 1, 1937	13,825	20,650	39,542	5,539	28,862	8,278	12,374	14,168
Reported Built — 1925 Census	1,161	1,567	5,165	583	*2,105	1,125	894	1,548
Installed: Jan. 1, 1925–July 1, 1927*	2,293	3,086	10,172	1,147	4,146	2,215	1,760	3,047
Less than 10 Yrs. Old — July 1, 1937	11,532	17,564	29,370	4,392	24,716	6,063	10,614	11,121
Over 10 Yrs. Old — July 1, 1937	10,606	38,735	97,226	9,875	53,733	21,425	9,787	26,046
Percentage Old Machines July 1, 1937	48	69	77	69	69	78	48	70
Percentage Old Machines Jan. 1, 1935	54	69	75	68	69	74	56	67

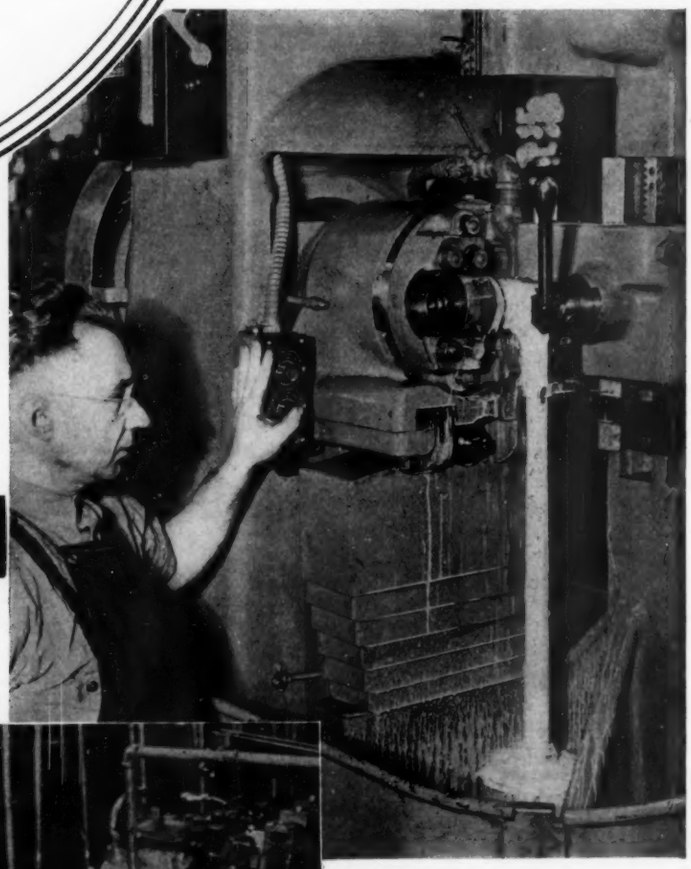
* Estimated from Census of Manufactures by using N.M.T.B.A. index and allowing for foreign sales.

Backstage

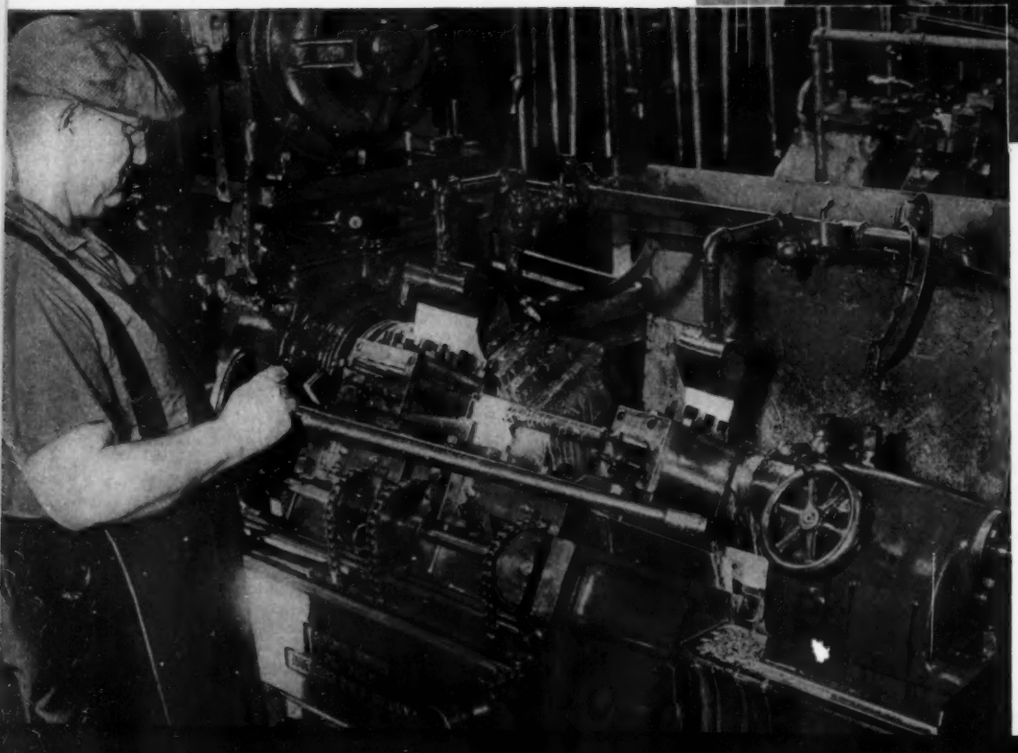
WITH A 5,000,000 unit year behind them and with high hopes of equally good business next year in spite of higher car prices, automobile manufacturers will show their new models to the public for the first time in New York next week, October 27-November 3.

Back of the scenes money has been spent for modernization and plant changes. Increasing costs of labor and materials must be counteracted by decreased production costs. Here and on the following pages we show where some of the money went and how savings are to be made.

Buick

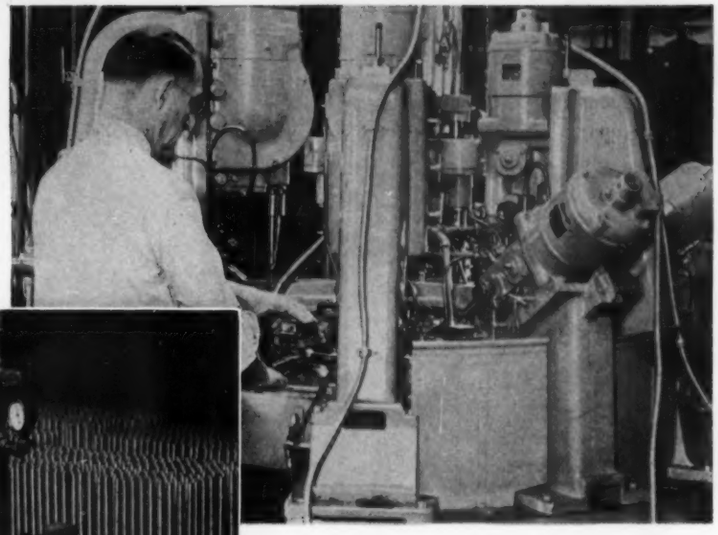


Pushbuttons on this Cleveland hobbing machine give instantaneous control of the spline-cutting operation on axle shafts



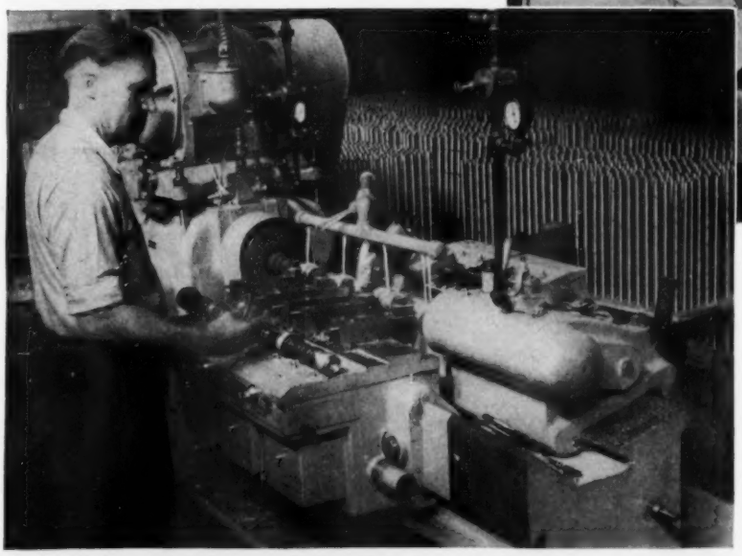
The rough machining operations on the axle shafts are performed in Le Blond automatic lathes

of the Automobile Show

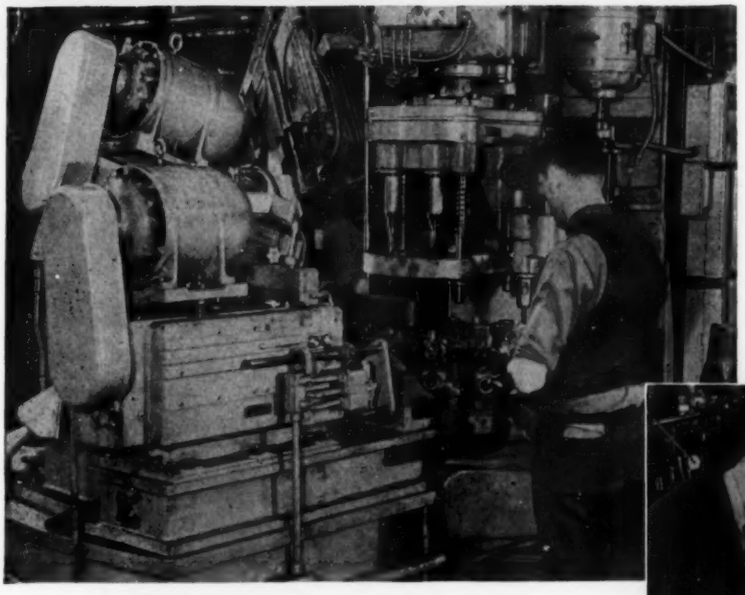


A Landis grinder puts the finishing touches on the thrust bearing of the crankshaft for a Series 40 engine

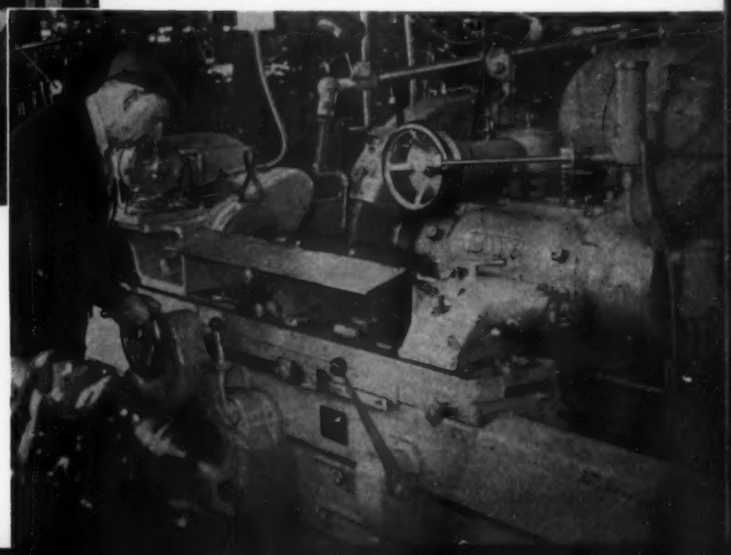
The camshafts are rough faced on this Lo-Swing lathe. Note the hydraulic chucks at each end



BUICK has spent $10,000,000 for tooling its 1938 cars and for further expanding its facilities at Flint to supply the needs of its Linden, N. J., and Los Angeles assembly plants. Principal equipment expenditures were to increase the output of engine. Of $3,700,000 for new equipment almost half was spent in the motors plant, chiefly in duplication of machines already in use to bring certain machining and sub-assembly operations up to required capacity. The axle plant was extensively revamped and new machinery added. Additional steel and die storage space in the sheet-metal plant cost almost $600,000. New presses were installed, docks constructed and new materials handling machinery provided.

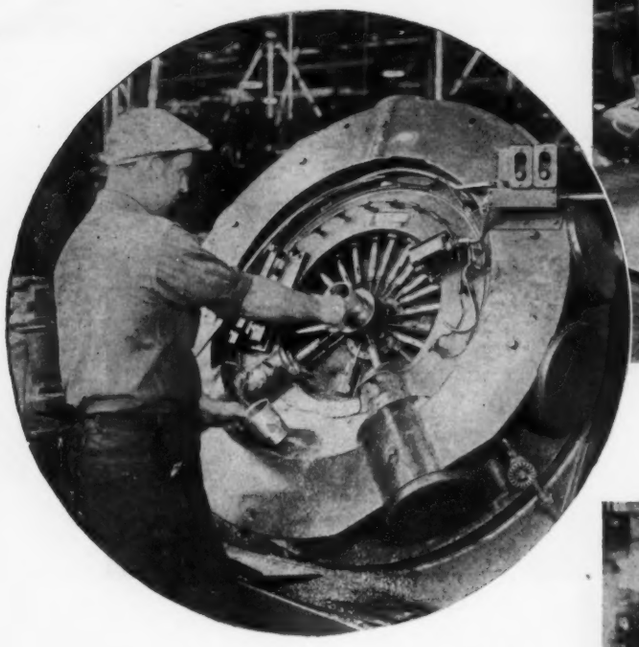


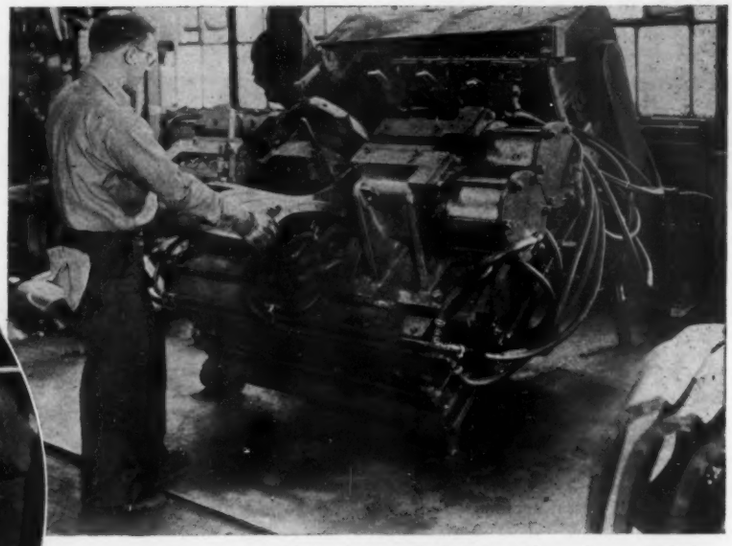
This Kingsbury automatic drills, taps and faces valves for Buick rocker arms. All machines in the motor plant are painted a light color



An eight-station indexing drilling machine by Ex-Cell-O is used on oil pump bodies

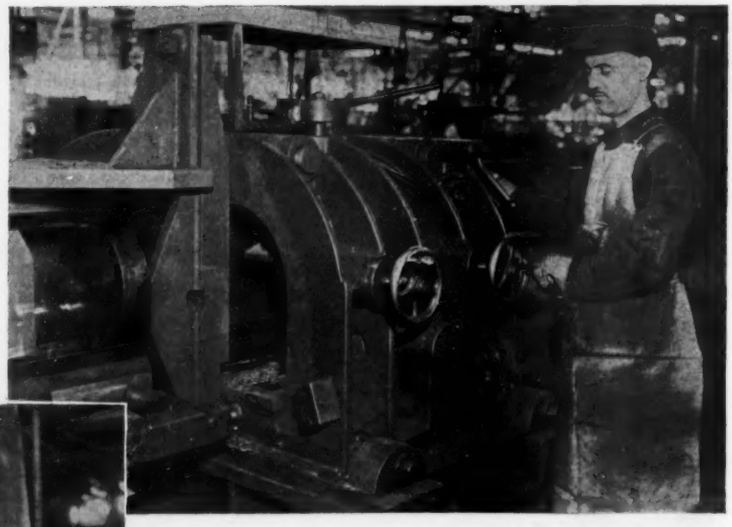
Chrysler

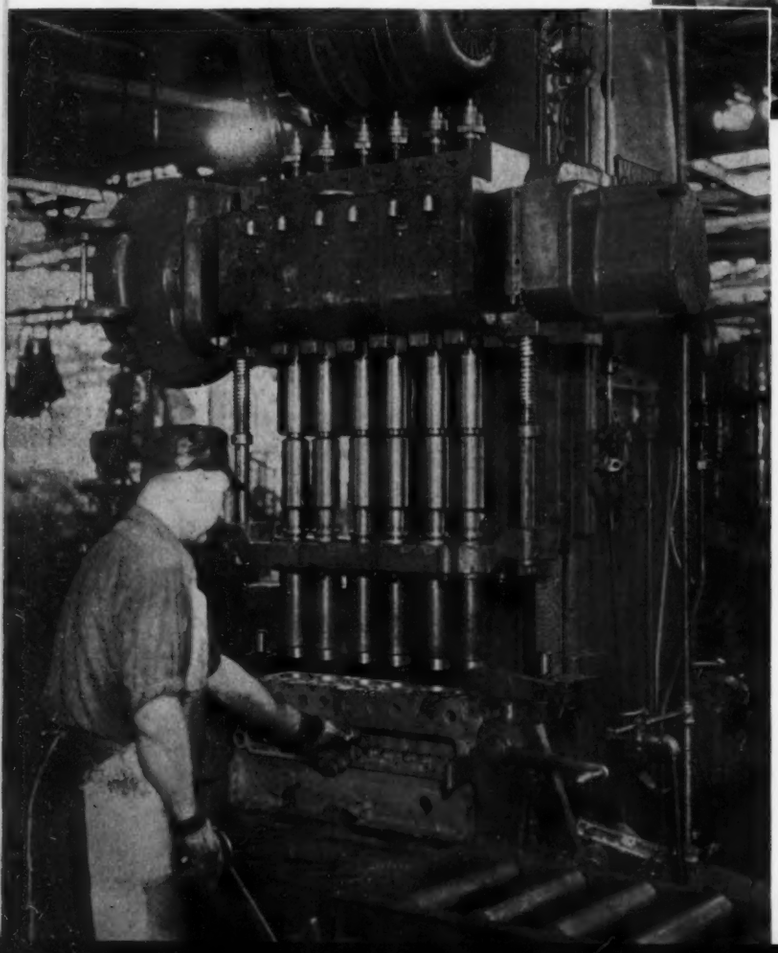




This Taylor-Winfield machine takes two halves of a radiator shell, welds them together

Above, all oil relief holes in the pistons are drilled at one time in this Kreuger machine with a convenient tilted top. *Right,* a Cincinnati machine for broaching the manifold face of the cylinder block in one operation has a moving gate to permit progressive travel of work

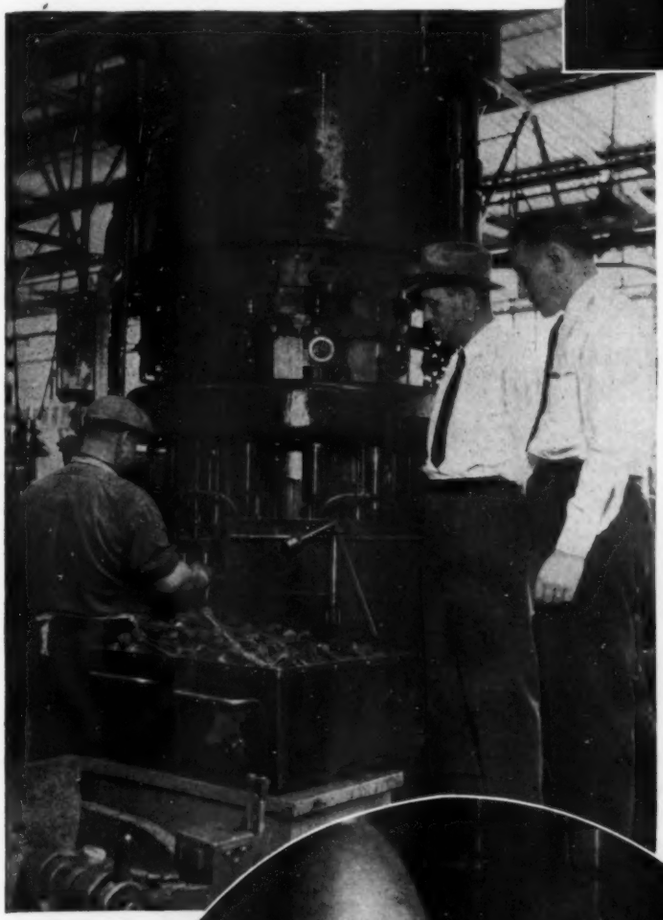




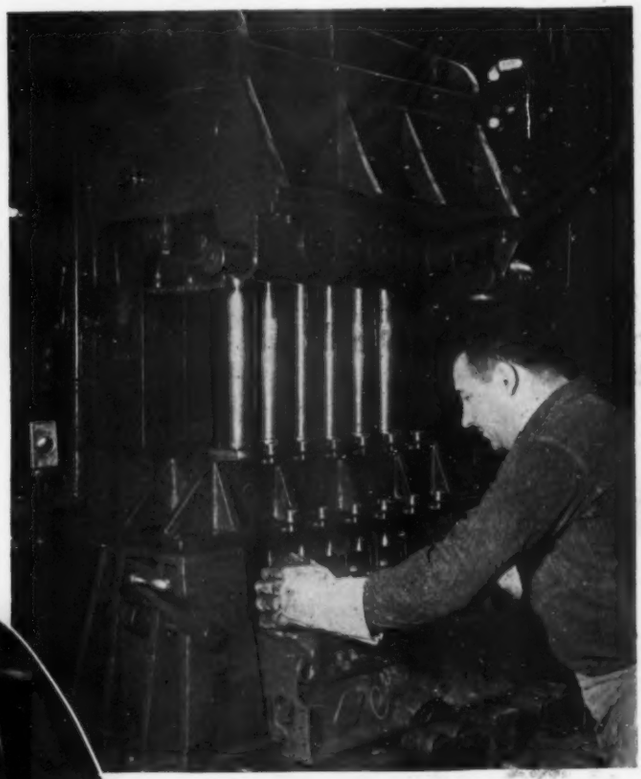
WITH A growing demand for Chrysler and De Soto cars, Chrysler Division of Chrysler Corporation, has found it advisable to increase the capacity of the engine line at the Jefferson Avenue plant in Detroit where motors for both lines of cars are produced. A new method of making radiators has been introduced for 1938, the two halves being welded together. Most of the machinery bought recently and here illustrated is a duplicate of machines already installed.

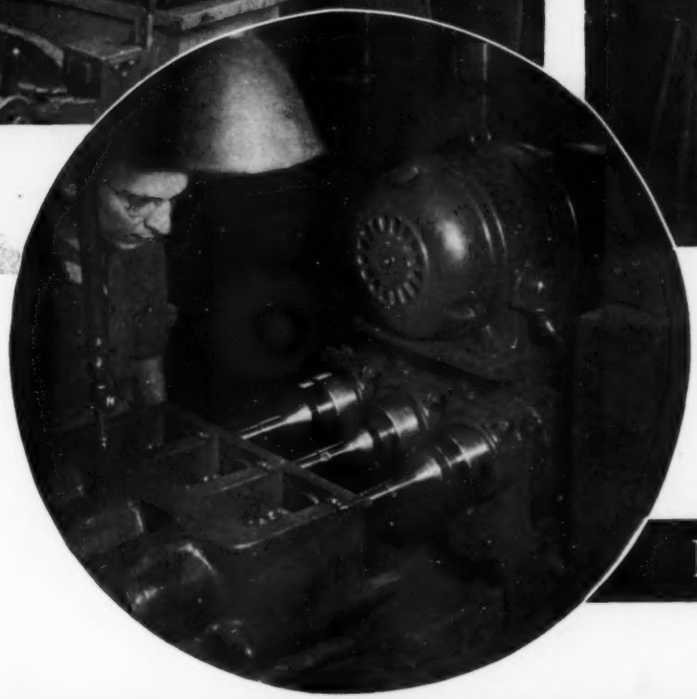
The bottom of the cylinder bore is chamfered from the top in this Moline drill press

PLYMOUTH is going into its tenth anniversary line of cars with 25 per cent greater capacity than any other single assembly plant in the world. It has further modernized its equipment to produce automotive parts of the highest quality. Works manager E. S. Chapman and master mechanic Otto Franke inspect some of the new equipment.



Above, this diamond boring machine is accurate to 0.0003 in., is set up in a temperature controlled room. It is used to bore the wrist pin hole in the pistons. Fixture and machine are hydraulically operated. *Left,* the wrist pin holes at the small end of the connecting rod are drilled in this continuous rotary drilling machine which with its weight of fifteen tons makes it the biggest ever



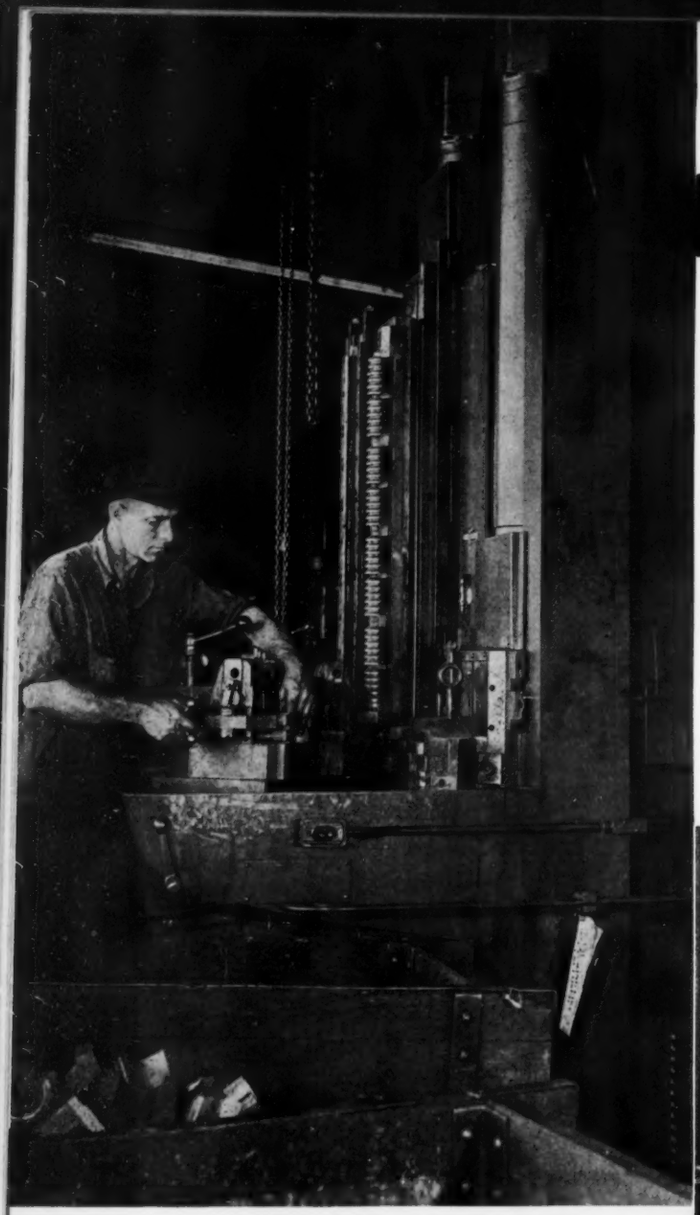


Left, all the brake-cylinders for each wheel are diamond-bored. Two-step diamond boring of the brake-cylinders for each wheel is done in this machine to allow the fit of two separate pistons of different size. Hydraulic clamps hold the cylinder during the operation. *Above,* a cat's paw behind the cutter gives the boring bar increased rigidity for finish-boring the inside surfaces of cylinders in this precision machine

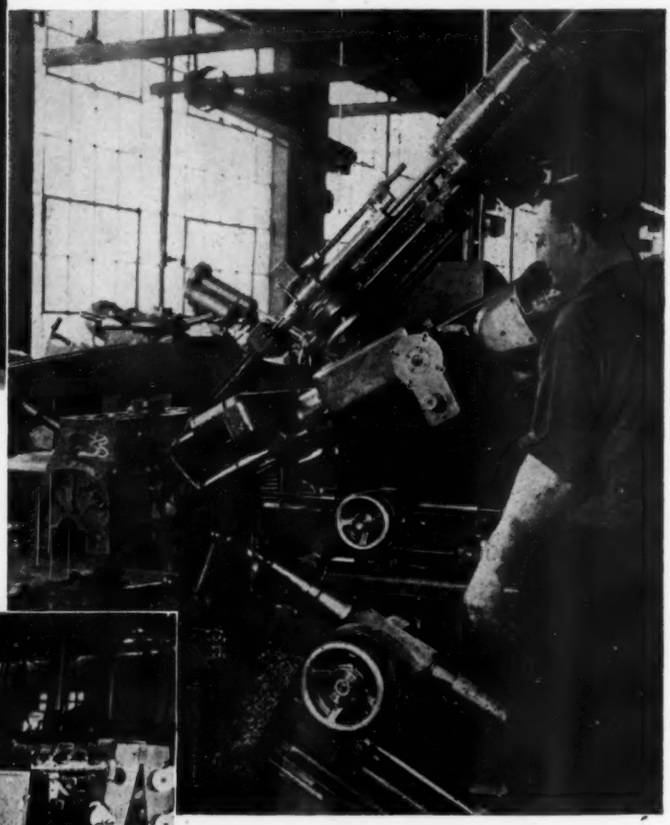
Plymouth

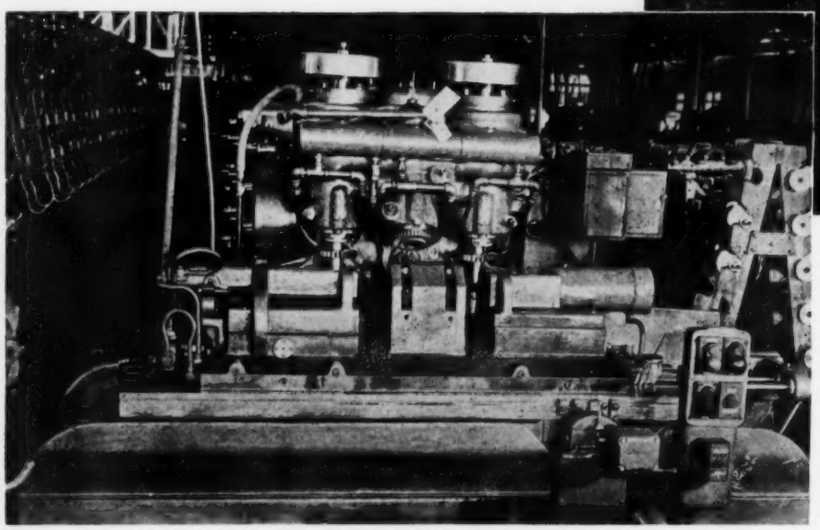
Studebaker

STUDEBAKER, having just closed one of the best years in its history, has made a capital outlay of around $3,500,000 in preparation for a big year in 1938. About $1,000,000 represents new equipment, much of which has been put into the motor machine shop. In some cases, this equipment duplicates that already in the shop and has been installed chiefly in the cylinder block, crankshaft and connecting rod lines. The machine shop capacity is being brought up to a basis of 60 units an hour.

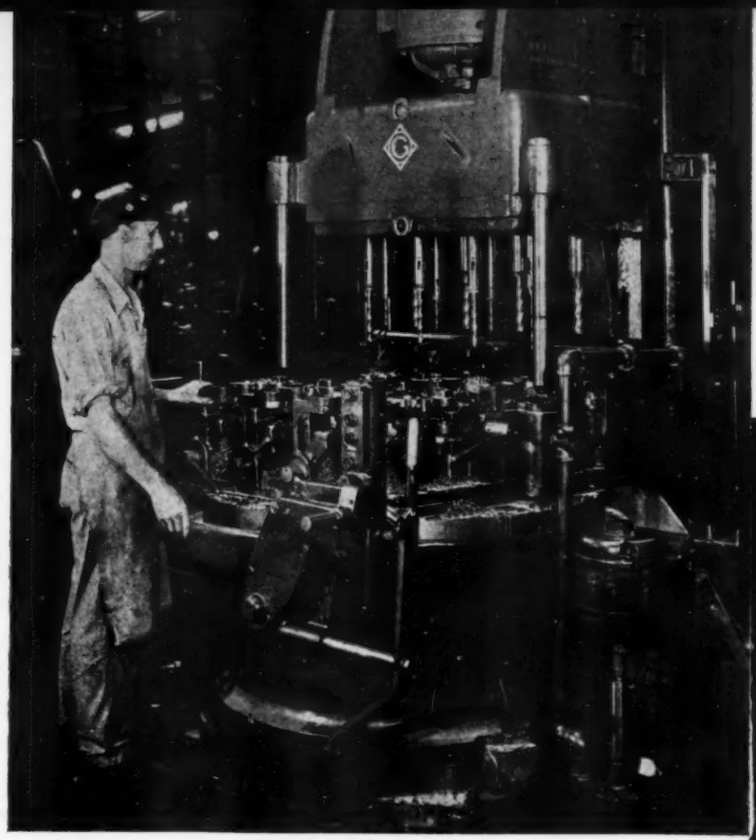


Bearing radius and all finished surfaces of the bearing caps are rough finished on this Cincinnati vertical hydraulic broach



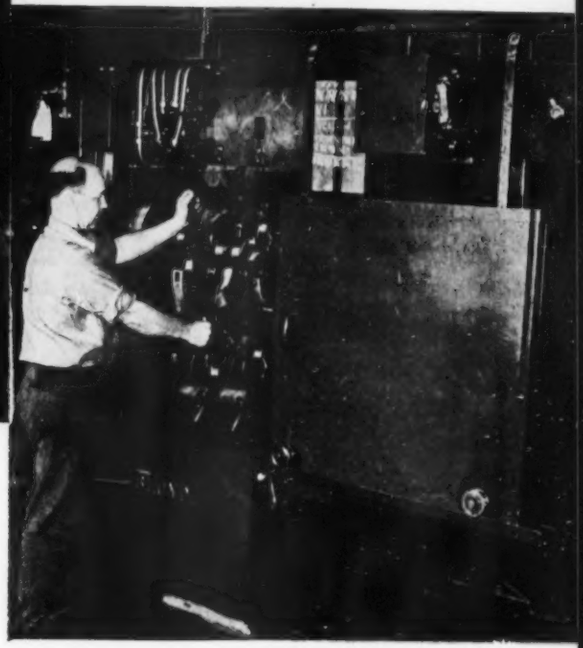


An Ingersoll five-way machine (above) drills distributor hole and oil pump hole in the cylinder block. A Sunstrand special machine (left) mills the chuck driving spots on the crankshafts

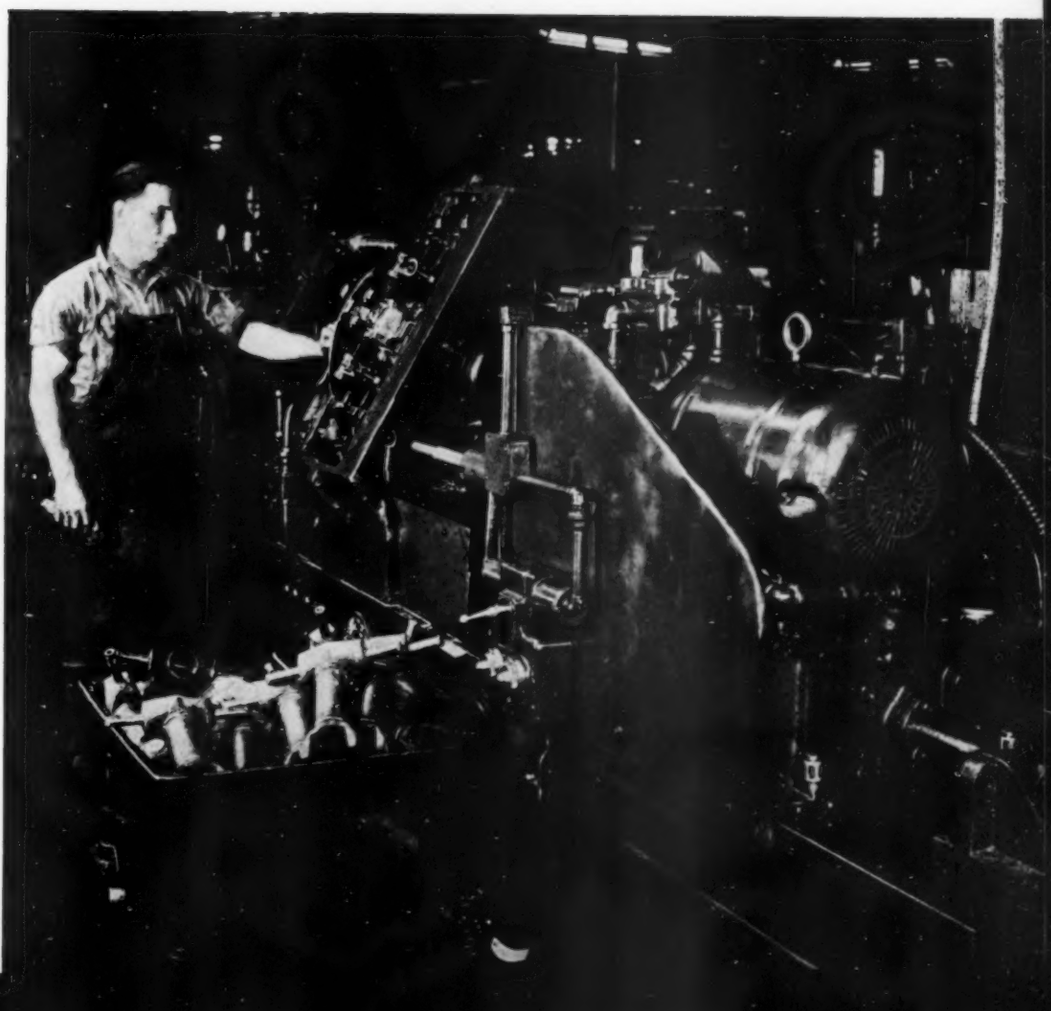


Steering knuckle supports are drilled in the twelve-spindle Greenlee hydraulic feed drill above

All pins of two crankshafts may be turned and checked at one time in this LeBlond automatic lathe



A special Synder double-end, two-way drilling and reaming machine is used on the forged end of the steering knuckle support arm assembly. Hydraulic system for moving spindles in and out can be seen on front of machine. Special tote pans are used to carry parts along the production line, hold them at a convenient height for operator to pick them up

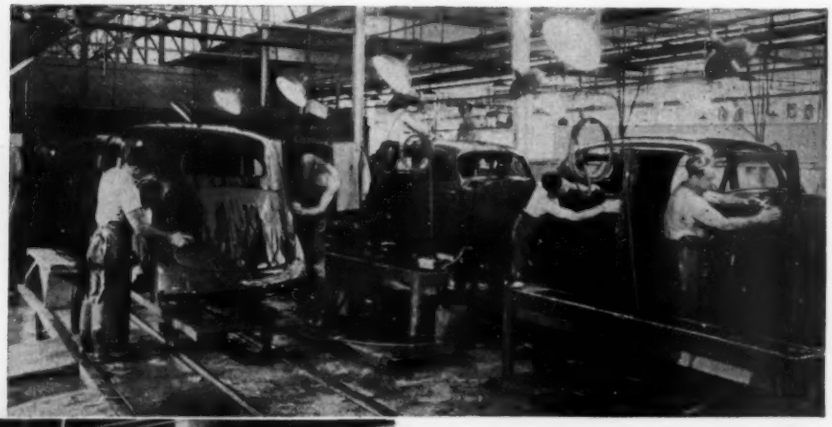


Willys all-steel unit-welded bodies are put together here; arc welding operations are carried on in the curtained inclosure

Willys

WILLYS was one of the surprise performers of the 1937 automobile season, having staged a remarkable comeback with a car priced considerably under the Ford - Chevrolet - Plymouth level. During the past model year the factory at Toledo built over 70,000 cars. Herewith are shown some of the manufacturing operations which have reemployed thousands of workers in Toledo.

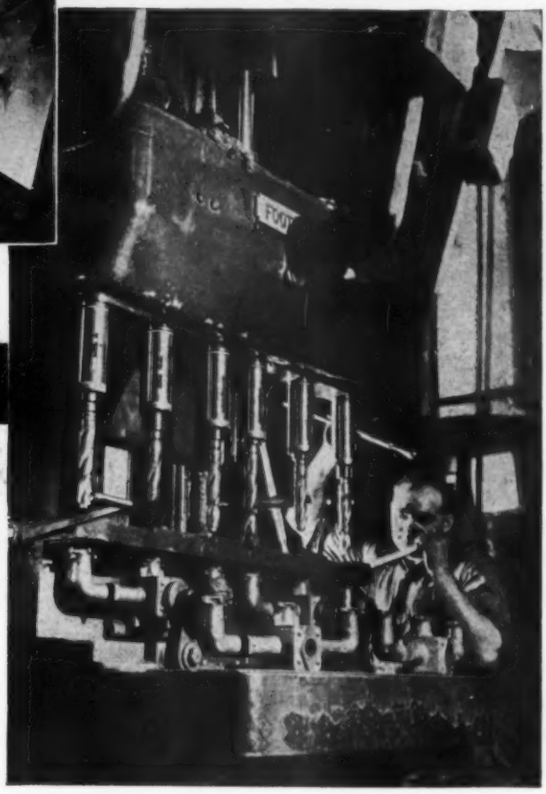
All bodies are washed with an alkaline agent to remove the acids which cause bubbles in the final enamel finish



Every man on this assembly line has high hopes of passing the 1937 mark of 70,000 cars

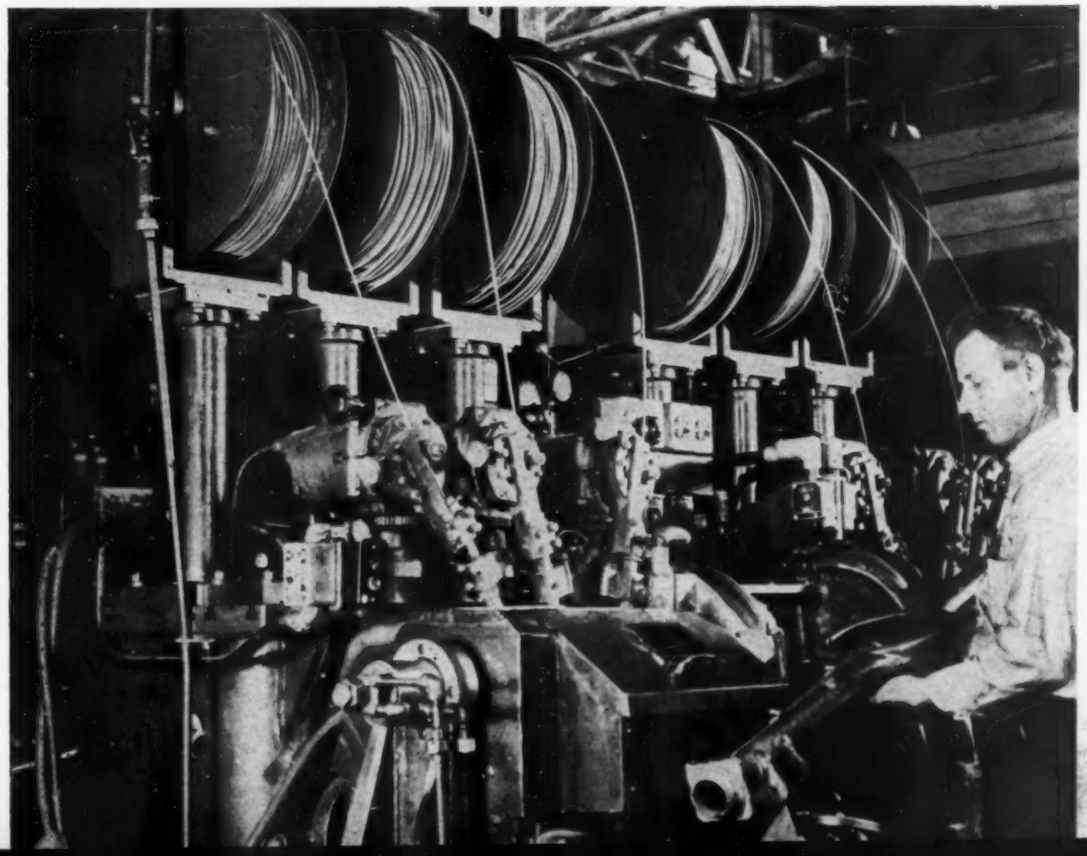
A Sunstrand milling machine is prepared to take finishing cuts on carburetor intake manifolds

Vents of two intake manifolds are counter-bored at one time in this Foote-Burt machine



Chevrolet

DURING the past year Chevrolet Motor Division of General Motors has spent millions on new equipment to modernize its factories and increase its output. It has installed much new equipment in its various manufacturing departments for the '38 season. A huge plant at Buffalo which is expected to enlarge the company's capacity of motors and axles some 1200 units a day is being rushed to completion.



This new welding machine at the gear and axle plant at Detroit performs six welding operations at the same time. The rear axle housing rotates on the machine to permit welding of six spring seat flanges

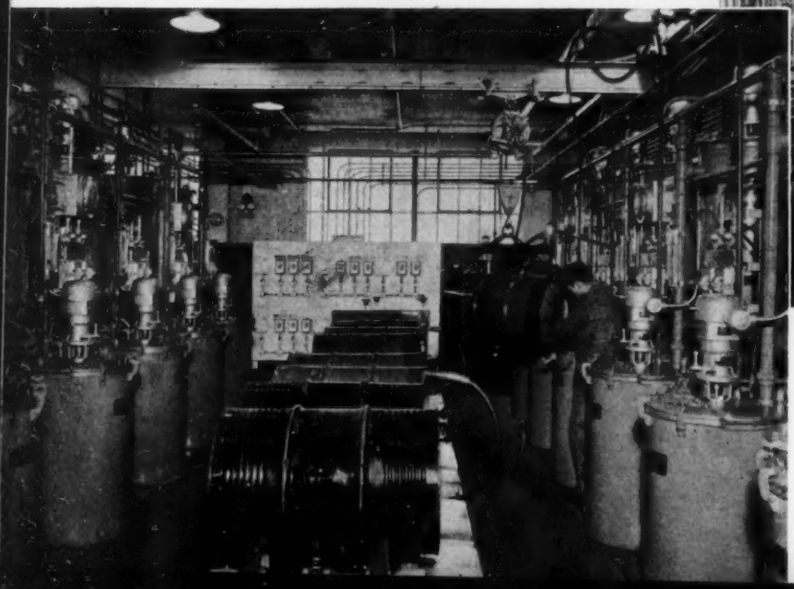
Nash

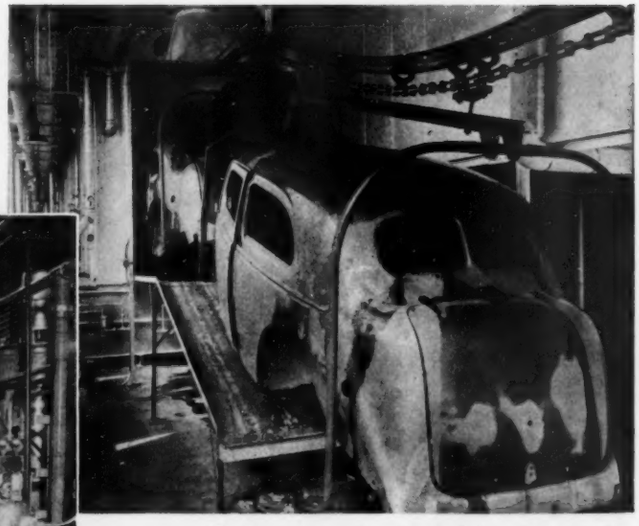
A battery of Fellows machines is used for gear lapping operations in the Kenosha plant

WITH 1937 production 100 per cent greater than it was in 1936 and with good prospects ahead, Nash spent $2,000,000 on a modernization program in its Kenosha, Racine and Milwaukee plants. Production capacity has been practically doubled. One of the notable improvements is the re-arrangement of conveyor and main production lines to eliminate all back-tracking of material.

Included in equipment recently installed are Heald Bore-Matic machines used for boring gears

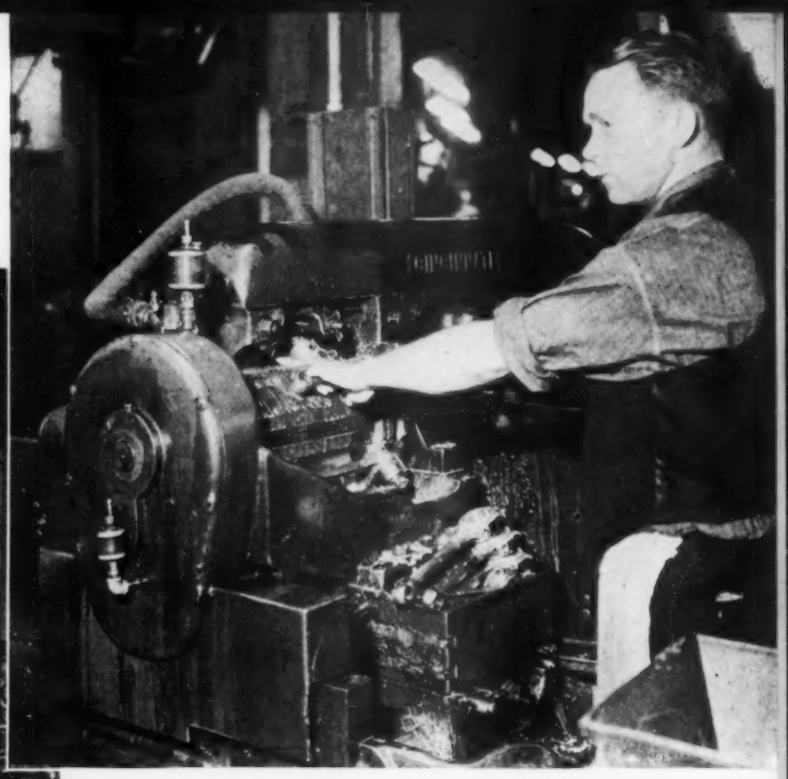
Nash engineers claim to have developed a body paint which will last twice as long as any heretofore used, mix it in this central paint-mixing department. Note the care taken with electrical equipment to avoid explosion





Bodies enter the bonderizing furnace for rust-proofing prior to painting. Arrangements have been made to bonderize all Nash bodies this coming year.

The forged connecting rods go through a special Toledo coining press to bring the oval hole down to the round. This is a conveyor-type press which is fed by the operator, the rods dropping into a box as they come out of the press

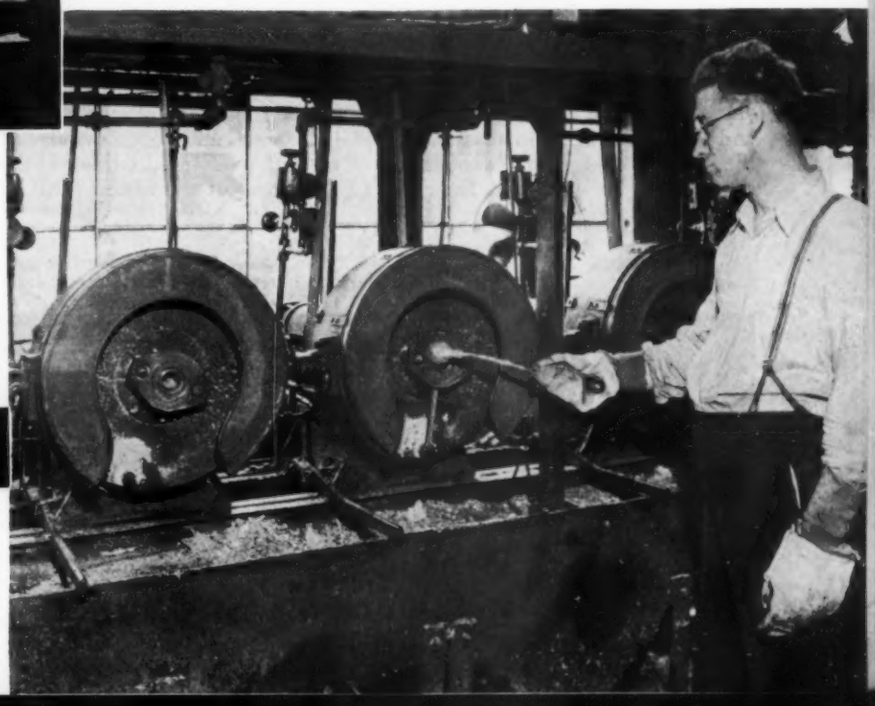


The cap is cut off the rod (rod thus being split into two parts) on a Cincinnati hydromatic milling machine

HUDSON, among the largest of the independent car makers, has just closed its most successful model year since 1929. One of the changes made in manufacturing practices for 1938 is in the method of making connecting rods. The new method eliminates the use of shims.

After babbitting and prior to final inspection hole in the big end of the rod is broached

Rods are held in special clamps as operator pours babbitt in large end



Hudson

Lateral and Valve-Gear Calculator

Tedious figuring of fractions in connection with these railroad repair operations is eliminated by a non-logarithmic slide rule

H. W. STOWELL

THERE has been developed at the Albuquerque shops of the Atchison, Topeka & Santa Fe Railroad a non-logarithmic slide rule by which it is possible to add and subtract inches and fractional parts thereof and automatically to divide the results by two or four. This type of calculation is common in the railroad shop and is necessary in figuring the lateral on trucks and driving wheels, and also for figuring the changes in valve gears.

The principal difficulty in figuring lateral is to reduce all the fractional measurements to a common denominator. The special slide rule overcomes this difficulty.

In taking lateral, that is, figuring the thickness to which the hub-wearing surface of the driving boxes should be faced, it is necessary to measure the distance across the pedestal legs of the frame where each of the respective drivers goes in place. This is usually done by marking the distance on a stick. The distance between the wearing faces of the wheel hubs is then measured with a slip gage and the difference between these two dimensions is noted. From this difference the thickness of the flanges of the two driving box shoes or wedges must be subtracted, for these are between the box and the frame when in place. Also, the amount of free side motion or lateral must be subtracted from the above difference, the result then being divided by two to obtain the thickness to which each driving box must be faced.

Sometimes it is possible to take lateral with the shoes and wedges in place, but usually it is desirable to figure it before the shoes and wedges are put up to lay them out. This gives the operator a chance to finish the boxes ahead of the shoe and wedges.

Suppose, for example, that the difference between the distance across the frames at the pedestal legs and that between the hub liners on the wheels is 7 in.; that the thickness of the flanges on each shoes and wedge is 1 in.; and that the total predetermined lateral movement of the wheels is $\frac{1}{4}$ in. Then the hub-wearing surface of each box must be faced to a distance from the inner side of the outer flange to allow for a total lateral movement of the wheels of $\frac{1}{4}$ in. This distance, X, is:

$$X = \frac{A - (2B + C)}{2}$$

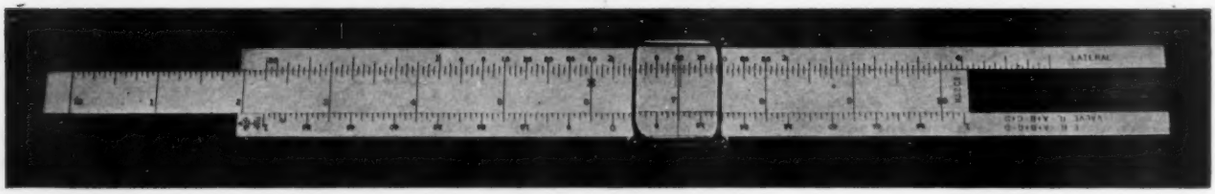
where A is the difference between the distance across the frames at the pedestal legs and that between the hub liners of the wheels; that $2B$ is the thickness of the flanges of both shoes or wedges; and that C is the total predetermined lateral movement of the wheels. This equation can be solved by one setting of the slide and one of the runner on the special slide rule shown.

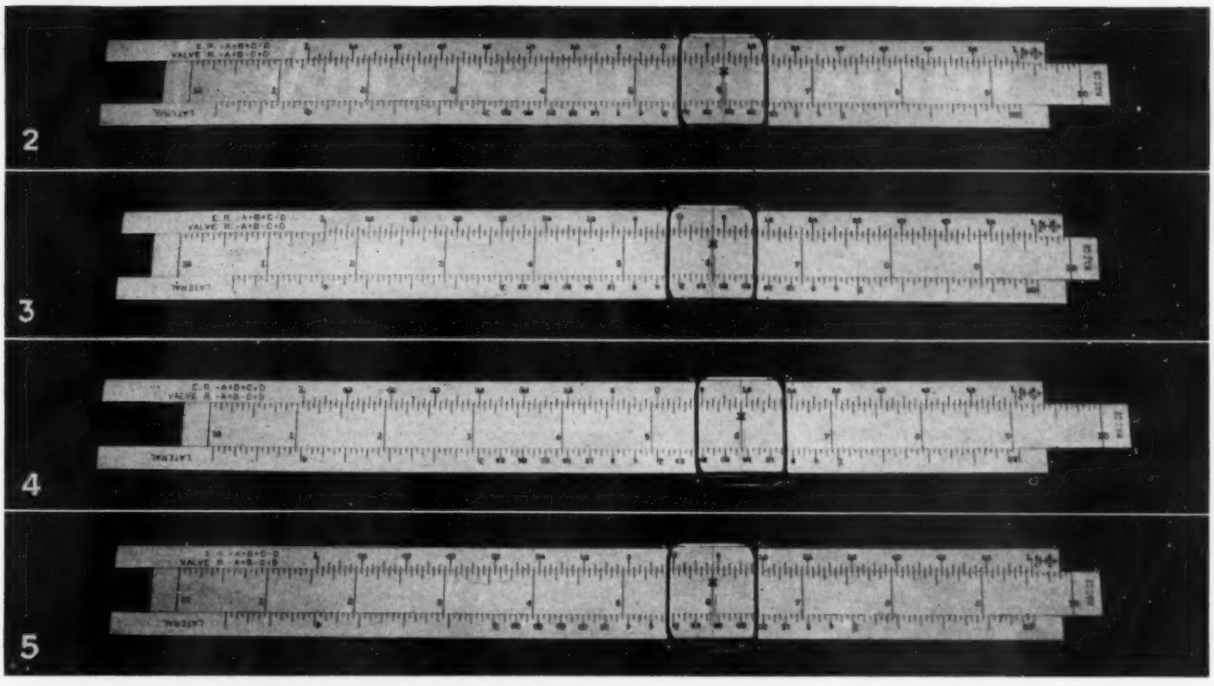
Referring to Fig. 1, the slide of the rule is pulled out $2\frac{1}{4}$ in. This represents $(2B + C)$ which is to be subtracted from A. Next the runner is set so that its hairline coincides with 7 on the slide. Then the value of $A-(2B+C)$ would ordinarily be read on the upper scale under the hairline. But this upper scale, or "lateral" scale, is graduated one-half the size of the slide scale in order automatically to divide by 2, (the denominator in the equation). In other words, one division of the "lateral" scale is equal to two divisions on the slide. And the divisions, although $\frac{1}{16}$ in. apart, are read as 32nds. The correct reading for lateral is 2-12/32 or $2\frac{3}{8}$. This is the distance to face the lateral wearing surface of each block.

The slide rule can also be used to figure changes in Walschaert valve gears in order to square an engine. In such work it is necessary only to shorten or lengthen the valve rods, eccentric rods, or occasionally a link hanger. The combination lever, union link, and other parts, if made to print, will not require any change by the valve setter.

Condition of the valve gear may be shown conveniently by a small diagram to represent the marks made on the valve stem by the valve

Fig. 1—When figuring lateral, the slide and lateral scale are used, the latter giving the answer in inches and 32nds

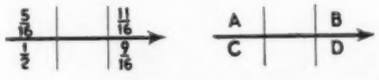




Figs. 2-5—When calculating valve-rod or eccentric errors, the slide is reversed. After four movements of the slide the error is read on the upper scale directly in 64ths

setter. Forward motion should always be placed above the back-up motion and separated by a horizontal line. The arrow represents the front of the engine and the vertical lines the portmarks. The figures give the amount of port opening.

Suppose that after running over or trailing, the gear is found distorted as follows:



Let A, B, C and D represent the respective port openings. Let X_1 represent the valve rod error. Then:

$$A + X_1 - (B - X_1) = D - X_1 - (C + X_1)$$

This represents the condition of the gear when the valve rod has been corrected, but it may still be effected by eccentric rod error. Solving:

$$X_1 = \frac{B - A + D - C}{4}$$

For eccentric rod error the port openings are as above, and X_2 is the value of the error. Then:

$$A + X_2 - (B - X_2) = C - X_2 - (D + X_2)$$

$$X_2 = \frac{B + C - D - A}{4}$$

times the ratio of the gear.

Since the eccentric rod does not move the rod directly but transmits its motion through the long drop of the link heel, the error produced at the valve must be multiplied by the ratio of the gear to find the actual eccentric rod error.

In either formula, the order of the letters is immaterial, but the proper sign, plus or minus, must precede each letter.

Substituting the numerical values in the formulas:

Valve rod error =

$$\frac{\frac{11}{16} - \frac{5}{16} + \frac{9}{16} - \frac{1}{2}}{4} = \frac{7}{64}$$

Eccentric rod error =

$$\frac{\frac{11}{16} + \frac{1}{2} - \frac{9}{16} - \frac{5}{16}}{4} = \frac{5}{64}$$

times the ratio of the gear.

In using either formula, if the result comes out negative, that is, less than zero, shorten the rod. If the result is positive, lengthen the rod. In the case of large errors the travel mark may fall inside the port marks. In this case it is called "blind," and the amount blind should be carried as a negative number.

For valve work the slide rule is turned to bring the valve scale uppermost and the slide is reversed. The valve scale operates the same as the lateral scale, but is graduated so that 1 in. is equal to 4 in. on the slide, whereas the lateral scale is graduated in a 1:2 ratio. Moreover, the valve scale is graduated both ways from zero at the center to take care of positive or negative numbers. A step by step solution of the foregoing problem will illustrate its use.

First step (Fig. 2). The point x at the 6-in. mark on the slide is taken as a convenient reference point. The runner is moved to the right by $\frac{11}{16}$ on the slide scale, the value of B. Then the x-mark on the slide is made to coincide with the runner hairline.

Second step (Fig. 3). The value of A, or $\frac{5}{16}$, is to be subtracted from B. Move the runner $\frac{5}{16}$ to the left on the slide and then move the slide x-mark to correspond with the runner hairline.

Third step (Fig. 4). Move the runner to the right $\frac{9}{16}$, the value of $+ D$. Again make the x-mark on the slide correspond with the hairline.

Fourth step (Fig. 5). Move the runner $\frac{1}{2}$ to the left on the slide (the value of $- C = \frac{1}{2}$). Again make the x-mark on the slide correspond to the runner hairline.

Fifth step (Fig. 5). Under the hairline on the upper scale read the valve rod error, or change, in 64ths. The value is $\frac{7}{64}$ in. and falls on the right-hand side of the zero mark, so it is positive. Lengthen the rod. The same type of manipulation of the slide rule is used for finding eccentric error.

PORTABLE REPAIR SHOPS

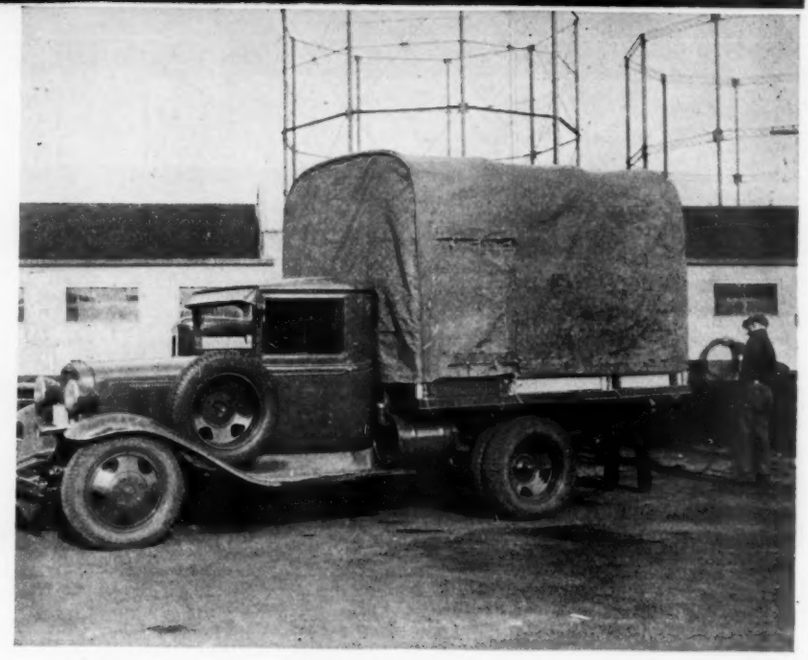
Taking the shop to the job is necessary when scattered equipment must be maintained

MOTORIZED repair shops, designed and equipped to perform major repairs in the field on tractors, trucks, graders, bulldozers, rotary scrapers and similar equipment are coming to play an important part in Civilian Conversation Corps field activities. According to Robert Fechner, director of Emergency Conservation Work, the first two such portable shops are now in use by the Forest Service, one each in Arizona and New Mexico, where work sites are often long distances from commercial or government repair shops.

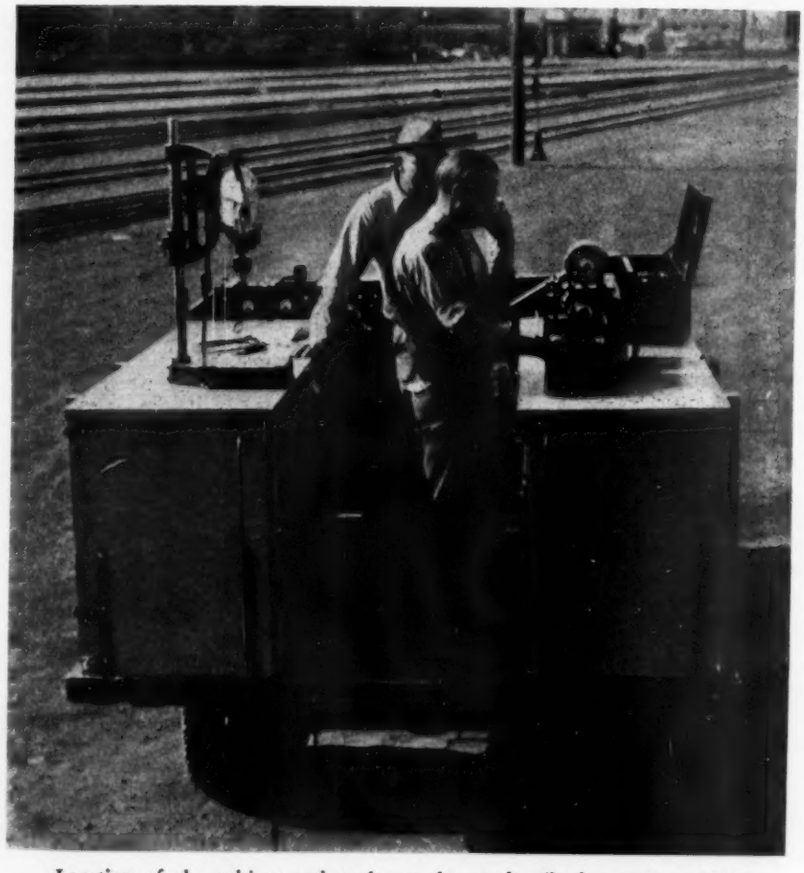
Mounted on a regular 1½-ton truck chassis, these repair units are quickly available at the break-down location and heavy equipment can be properly repaired and the equipment put back to work with a minimum loss of time. Each shop is equipped with a full set of tools and essential repair parts and is handled by a competent mechanic able to perform repairs with efficiency and dispatch.

Power for the shop is obtained by use of a Ford V-8 motor and assembly. This power plant operates a welding unit, drill press, emery wheel, polishing head and similar equipment. Design of the platform, cabinets and shop equipment is such as to provide adequate working space and suitable location for the rigid units. The equipment, tools and cabinets weigh approximately 3,000 lb.

Aside from the definite but purely economical advantage afforded by these units, opportunity is taken to train CCC enrollees in mechanical repair work. This affords the boys an exceptional opportunity for first-hand and worthwhile vocational training on the job.



Adequate protection is afforded the equipment on this portable machine shop by the tarpaulin cover



Location of the cabinet and tools on the truck affords ample working space for the operator of this portable repair shop

TALKING SHOP

Labor Rows

Although the newspapers are full of facts and opinions on the merits of the vigorous controversy between the American Federation of Labor and the Committee for Industrial Organization, not much light is thrown on the problem of the shop manager or foreman who has to live with men who belong to these unions and men who don't. Besides living with them he has to keep on getting out production. Some of the higher ups look with considerable equanimity on the knock-down, drag-out scrap for control of the union movement which is being staged by Mr. Lewis and Mr. Green, but to the man farther down the line the whole affair is a terrific headache.

Take the case of the old timer in one shop where both unions had a following and where the struggle for supremacy was keen. He came

to the boss one day and said, "I wish you would tell me what I ought to do about this union business. I am pulled first one way and then the other and I am so fed up with it I'd give anything to be a thousand miles away from here." When a man feels that way it is pretty sure that the quality of his work is going to suffer. He is too busy thinking about something else to concentrate on the job in hand.

Men of considerable experience in labor matters insist that the only way to handle such a situation is to make up your mind which crowd you are going to deal with and then find some way to get rid of the other one. Under the provisions of the Wagner Labor Relations Act of course it is illegal for an employer to do anything to influence an employee as to what labor organization he shall join or refrain from joining, but there are sure to be occasions when employers will have to be practical about the matter and possibly take a few liberties with the strict interpretation of the law.

Independent Associations

Almost nothing in the way of news about independent employee associations gets into the daily newspapers, yet there are many of these associations and some of them have been conducting business successfully for several years. Some have

incorporated or taken out state charters; others have not. Such action does not seem to have been a determining factor in the success or failure of these groups.

Employers are prohibited by law from assisting such associations and the National Labor Relations Board has certainly done everything in its power to discourage them. Yet they continue to flourish. They stand as monuments to the indomitable independence or orneriness of the American workman. Some have sprung up as successors to works councils or employee representation plans that have been discontinued by cautious management. Others have been formed by employees who did not want to be herded into C.I.O. or A.F. of L.

While these independent associations are favored by a good many employers as against the national labor union they can cause just as much trouble as the regular unions if they cover but a portion of the total number of employees while the remainder belong to a federal union. The situation is very little different from that described in the previous item.

In some instances these independent associations lack the restraining balance of national union officers and can create more trouble for the manufacturer than he would have from a seasoned union with experienced officers. Some employers even go so far as to say that they would rather have a national union in the plant than try to deal with ambitious and inexperienced leaders of an independent group.

Super Foremen

As has been said so many times in the pages of American Machinist and elsewhere, the foreman occupies a key position in this whole picture of industrial relations. The combination of technical skill, teaching ability, grasp of proper industrial relations and initiative demands almost a superman for the job.

Managers motivated by the best intentions in the world have negotiated with their employees and have concluded what seemed to them eminently satisfactory bargains only to have these agreements fail to function because the foreman had not been properly informed of the

intention and policy of the management and forewarned as to the details of the agreement.

The suggestion has been made that the foreman could be selected for his ability to function as an industrial relations expert and a representative of management, leaving technical matters to an assistant who would be selected for his ability in that direction. This proposal sounds too much like the over-functionalization that ruined so many of the beautiful plans of the scientific managers of twenty-five years ago.

No workman will respect his foreman or do his best work for that foreman if he suspects him of being weak on the technique of his craft. A foreman must have that skill to hold his job. *The Editors*

Incentives—or What?

In fifty years many kinds of incentives for workers and executives have been tried. A few have succeeded, many have failed

FRED H. COLVIN
Editor, American Machinist

ABOLITION of piece work in the large automobile plants marks but one of the numerous changes that have taken place in methods of paying workers. Looking back over half a century of contact with machine shops and shop workers brings to mind many plans, much discussion and various opinions, all of which may have a bearing on the present.

Manufacturing, with its repetitive operations, brought straight piece work where the fast worker earned more than the average. There was no particular complaint until management, anxious to increase profits, cut piece rates, frequently without notice. While this action tended to speed up the men it made for hard feelings and developed various subterfuges. It also retarded production by making men loath to suggest better methods that would increase output. Extra rapid workers were frequently compelled by the others to slow down to an average pace.

To overcome this feature of straight piece work Fred Halsey devised his Premium System while managing a shop in Canada. By dividing the savings made with the men there was less likelihood of rate cutting. But it was too much of a temptation in many cases, and the percentages of the division were altered to give the men less than half, as in the original plan. Rowan in England, modified the plan so that the worker received a diminishing percentage of the savings as his efficiency increased.

Frederick Taylor reversed this in one of his plans, on the theory that the more a man produced from a given investment in machinery, the greater were the returns to management. And it is to his credit that he insisted on a fair remuneration to labor, even though he tended to put labor in the robot class by depriving it of initiative through a complete planning of every movement.

"Take it easy. Want a rate cut?"

Standard times and bonuses of various kinds have had many advocates, beginning perhaps with Harrington Emerson's work on the Santa Fe. The extent to which this standardization was carried is almost unbelievable. It included practically every operation of building or repairing locomotives and other equipment and occupied thousands of printed pages. Nor did the time standards discriminate between Topeka, Kansas, and Needles, Calif., where temperature makes work a burden at times. Much of this excess enthusiasm was credited to those who followed Emerson. I doubt if he would have carried it to such extremes.

Some of these systems embodied in themselves the security against a change in rates which all men desire. Recognizing this, some concerns, such as the Pierce-Arrow Motor Car Co. under Fred Kent, guaranteed piece rates for a year, regardless of how much the men earned. They figured that it was worth more to get the extra production out of their equipment than the cost in wages. It was also quite a common thing to agree that no change would be made unless there was a change in method. But even this safeguard did not prevent rate (or time) cuts when men earned what management considered "too much." One of my good friends who was a kindly sort of man in most cases admitted that there were times when the "change in method" was to grind the tool a little differently, where they had made a "mistake" in setting the standard time.

In a few instances I knew the management and the men got together on all cases of this kind. If the time or rate permitted men to earn very much above the average rate, the men agreed to its reduction. By the same token, the management

raised rates on jobs that had been estimated too low.

Since then there have been systems under various names and those who have installed them have frequently reaped a harvest in cash of the realm. Probably they have given value received in most cases. Practically all of them involve time study or motion study, or both. For the latter we owe much to the late Frank Gilbreth and his wife, Dr. Lillian Gilbreth. The object of all of them is to find economical methods of doing work and to reward workers with some sort of extra payment when they exceed a fixed minimum output.

There is also a group of industrial engineers who argue against extra financial incentives. One of the pioneers in this work was Robert Wolff who did excellent work in paper mills and other industries. He too set standards of operation but the incentives were largely those of personal satisfaction for good performance and public recognition of excellence. E. W. Hulett did a splendid job at the White Motor Co. without financial incentives. He was very close to his men, conferred with their representatives and had a very harmonious organization in every way for many years.

One large concern of industrial engineers has also abandoned direct cash incentives as a means of increasing production. Instead they have a basic wage rate which is usually somewhat higher than the "going wage" of the community. This enables them to have the pick of the men in the town. Executives would probably think this method is reversed in the salary list for they have a "top" of $6,000. Fancy salaries that create envy and keep the income tax men guessing, are "out" in their method. But there's a joker in the deck. The $6000 is virtually a drawing account, that is if the concern makes money. In addition to the semi-monthly salary check there is an additional payment at fixed periods, depending on the amount of business done and the net profit. Executives, from the president down, get a percentage of the net, the rate varying with the responsibilities of the position. It also extends down into the shop and is in addition to the basic wage.

In another case, where experienced engineers are concerned, a somewhat similar method is used. Every man on the staff gets a check for $100 twice a month. During the month he gets an additional check depending on his general rating by the big boss. Unless the boss finds him worth at least $200 a month more than the basic rate, he doesn't last very long. In addition each man gets a percentage of the net of the company. And the head of this concern doesn't believe in wage incentives?

This plan reminds me of one adopted by the Oneida Community shops during the war. Prices of foodstuffs and all other commodities were unstable, but plenty high. The men in the plant had to have more money. But the widely varying prices would mean constant change in wage rates.

They adopted the plan of paying in two envelopes. One was the base wage prevailing when we went into the war. The other was the HCL (High Cost of Living) envelope that was supposed to cover price increases due to the war. This varied with the published index of prices. The plan had the advantage of enabling the firm to reduce the HCL payments when prices dropped after the war, without the same feeling that wages were being cut.

It is probable that while piece work seems to be on the way out in mass production shops, where the timing of the conveyors or the machine set the pace, it may still have a place, in some form, in numerous shops. Whatever the system used, harmony can only be attained by confidence on the part of the men that they will be fairly treated. Mutual understanding and faith in the integrity of both parties, will carry shops through almost any crisis. And this is equally true whether workers be organized or not.

What Age Apprentices?

A. W. FORBES
Forbes & Myers

THIS QUESTION is asked (*AM*—Vol. 81 page 729), but before answering we must ask a few more questions. What kind of apprenticeship, what kind of boys, are you talking about? If the object is merely to give technical instruction and manipulative practice to selected boys who are prepared to receive it; if the object is merely to secure workers who will do their work in the factory according to instructions, to the specified limits, and in the predetermined time, then mature young men should be selected. If apprentices are to be sent into the shop where the morale is poor, where there is a spirit of trying to beat the management, or where other undesirable habits are liable to be formed, young men with well fixed habits and character should be selected. If the work involves long periods of monotonous or sustained labor, or of watching and waiting for the machine to do the work, maturity is needed.

There is an ample supply of young men 18 to 25 years of age for apprenticeship of this kind, many high school graduates with some vocational training, some college graduates. College graduates of good ability and character can be secured for $10 per week. They are even underbidding boys of 14 and offering to work for less than they would have accepted eight years earlier. So why should anyone want boys under 18?

But is this real apprenticeship? We may transfer the young man from department to department, so that he can operate any machine in the plant; we may add class room instruction in related subjects, and call him an all round machinist; he is still but a machine operator who can operate more kinds of machines. Apprenticeship should mean more than that. Once it did mean more, and it still means more in many of the smaller plants. Apprenticeship should have more to do with the development of character, with habits of industry, cooperation, care and judgment, than with the mastery of machine operations. There are more persons, I believe, who lose their jobs or who fail of promotion because of these character traits than from lack of technical training. How about the boys who might have made good apprentices when 12 or 14 years of age, but whose characters have been fixed in undesirable ways by the time they are 18? Should the starting age be made so high as to exclude them permanently from profitable work?

Probably the weakest point in our educational system is its failure to develop leaders. Trade schools can produce mechanics, but none have found the way to produce leaders in a class room. The work of apprenticeship should be centered on this most important need, but to do so we must get the boys when younger, certainly not over 14 years of age.

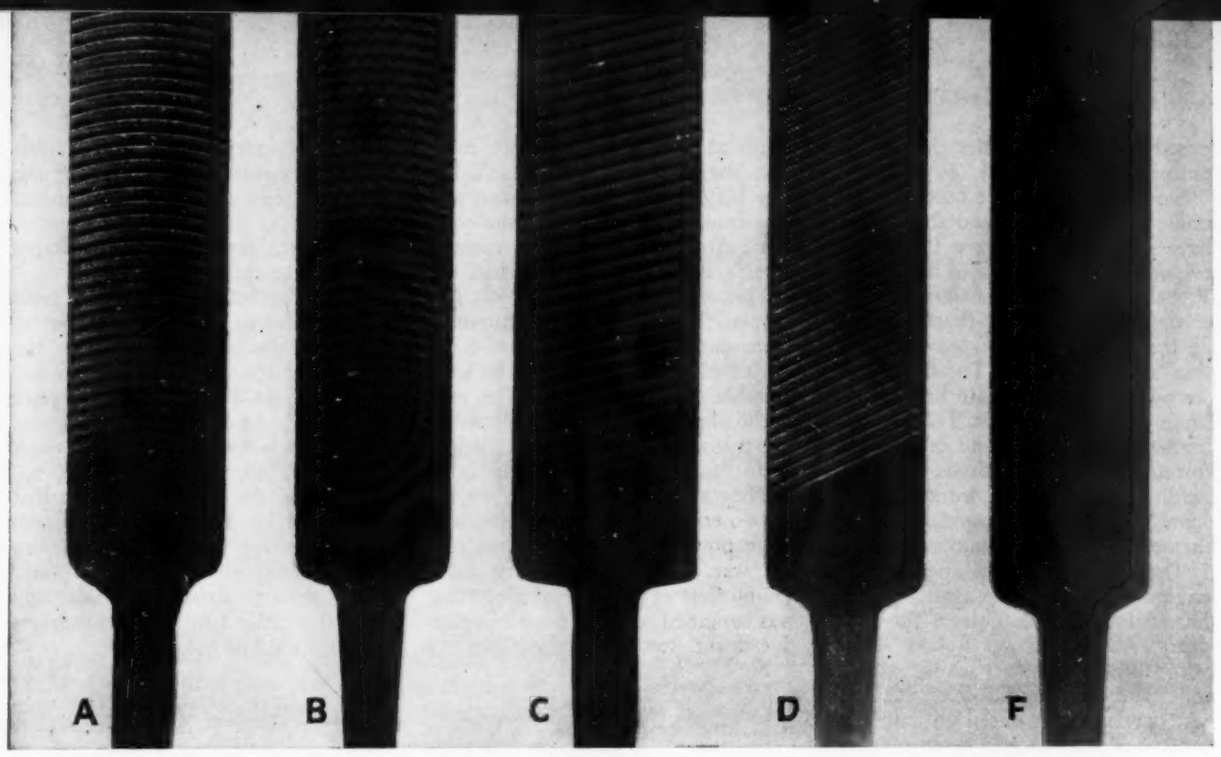


Fig. 1—Files *A*, *B* and *C* may be used to advantage in rough finishing relatively large aluminum surfaces. File *A* has been proven the most satisfactory for hand filing operations of this type. Files *D* and *F*, recommended for finish filing operations and for small parts, are also suitable for the harder aluminum alloys

Files for Aluminum and its Alloys

Filing technique depends as much on the skill of the operator as on the file selected

F. V. HARTMAN

Aluminum Research Laboratories, Aluminum Company of America

FILING is essentially a cutting operation; for best results files for aluminum should have keen, smooth edges which are provided with considerable side rake. Cuttings of most aluminum alloys are somewhat stringy and bulky; this tends to cause them to pack between the teeth if improper files are used. In general, files for aluminum should have fairly coarse teeth, deeply cut. Three types of files, suitable for general, coarse filing of aluminum are shown in Fig. 1.

File *A*, having a pitch of ten teeth per in., has curved teeth and is considered one of the best types for "general purpose" work on aluminum. Metal can be removed rapidly, and a smoothly finished surface can be produced. This type of file is difficult to handle if the teeth are much coarser.

Except for having notched teeth, file *B* is practically the same as file *A*. These notches break up the cuttings and permit more rapid removal of metal. Notches, however, cause the file to produce a scratched finish, which is objectionable for some work.

Straight Teeth May Chatter

File *C*, similar to file *A* except that the teeth are straight, may be used to produce satisfactory finishes. There is a greater tendency to chatter when this file is used than when one with curved teeth is employed. Files *A*, *B* and *C* represent, in general, the forms of coarse-tooth files that work best where rapid removal of the metal is desirable, particularly for the softer alloys.

Files of the type shown at *D* and *F* are more suited for lighter cuts, for filing smaller articles or for some of the harder alloys. The type shown at *D* has been proven to have good cutting ability. Although tooth pitch is fairly coarse, the teeth are not deeply cut. While this is a double-cut file, it may be best described as having single-cut teeth with a light second-cut. Notches, formed in the coarse teeth by the second-cut, break the cuttings into small pieces and help to produce free-cutting characteristics. Forcing this file heavily may cause the teeth to load. If the

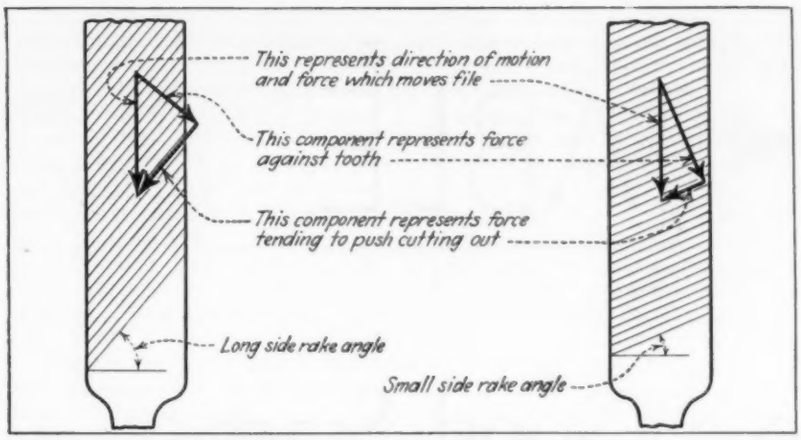

This represents direction of motion and force which moves file
This component represents force against tooth
This component represents force tending to push cutting out
Long side rake angle
Small side rake angle

Fig. 2—Cuttings are forced out of file teeth when the side-rake angle is large. Small side-rake angles limit self-cleaning of file teeth

teeth of this file were deeper it should prove effective for heavier work. Round and half-round files having teeth of this type have been found to perform satisfactorily.

The long-angle lathe file, *F*, has a side-rake angle ranging from 45 to 55 deg. This type file has proven most effective for finish work on aluminum. It cuts freely, and the teeth do not load. The large side-rake angle is desirable because it produces an efficient cutting edge, making the file cut freely. Another advantage of the large side-rake angle lies in the fact that the direction of motion of the file forces the cuttings out from between the teeth, making the file self-cleaning.

Side Rake Aids Cleaning

Self-cleaning induced by the large side-rake angle may be explained by consideration of the force diagrams shown in Fig. 2. From these diagrams it is obvious that a file having a smaller side-rake angle will have a greater tendency to pack cuttings between the teeth.

Long-angle files are usually made with medium-fine teeth. Satisfactory results have been obtained with teeth as fine as 21 per in. Coarser teeth are, however, usually more desirable for aluminum as they will permit taking heavier cuts without sacrificing quality of surface obtainable. Tooth pitches in the neighborhood of 12 to 16 per in. are generally preferable. The advantages of the long angle may be obtained to a degree with the ordinary hand-file having a small side-rake angle, providing the file is operated with a side-sweep motion.

Fig. 3 illustrates four types of files that are not well suited for filing aluminum and its alloys. File *H* has deeply cut, coarse teeth; they are curved and double-cut. Judging from appearances this file should produce good results. It is, however, unsatisfactory as it cuts poorly and slowly, producing an extremely rough surface. The same results generally hold true for all types of rasps.

File *I* represents a typical double-cut file which is widely used for other metals. This file cuts aluminum well, but the teeth load rapidly —except in the case of some of the harder alloys. Because of the double cut, a side-sweep motion will not prevent adherence of the cuttings to the teeth.

A coarse-toothed, single-cut file is shown at *K*, but the teeth are not cut deeply and they have a side-rake angle of only 4 deg. This file cuts poorly and loads badly. It cannot be made to function satisfactorily, even by employing a side-sweep motion.

File *L* represents a typical fine tooth, single-cut finishing file. Because of the fine teeth and the small side-rake angle, the file teeth load badly when filing aluminum.

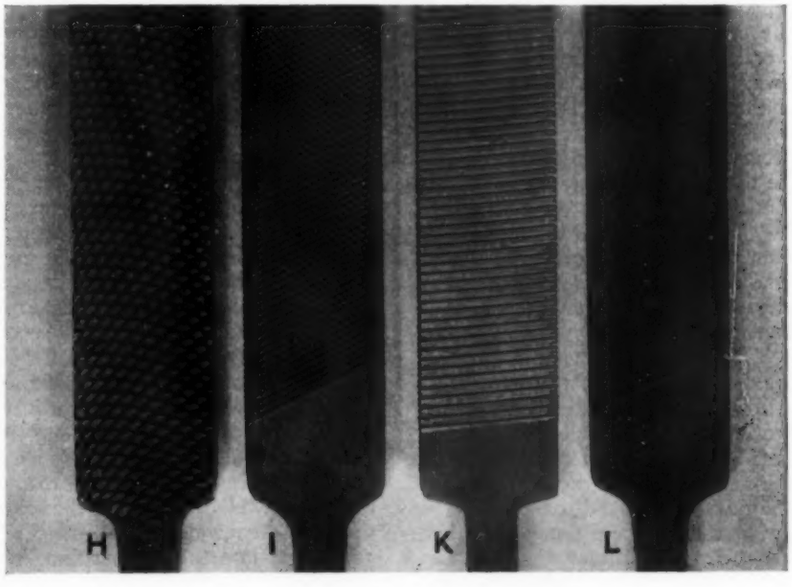
File Tooth Finish

Cutting tools for machining aluminum should have smoothly finished cutting edges. There may be enough difference in the finish of file teeth to account for an appreciable difference in the performance of files that otherwise appear to have about the same general characteristics. Rubbing chalk over file teeth, or oiling them, often helps prevent loading of the teeth. Chromium plating, if properly applied, will cause a file to work better, since the cuttings will not adhere to the plated surface.

The care of files is a factor too often overlooked. Throwing a file into a tool box on other files is one of the most common abuses to which a file is subjected. This practice obviously ruins the keen cutting edges. Files should be separated from each other and from other tools. They should also be prevented from rusting, as this will dull the tooth edges and roughen the surfaces so that cuttings will adhere and load the teeth.

The advantages of certain types of files when used with aluminum, as outlined above, also apply to rotary files and files used in filing machines. It is of importance that the more desirable features be employed in machine files as the human equation is eliminated in their cutting action.

Fig. 3—Files similar to types *H*, *I*, *K* and *L* have not proven satisfactory when used to finish aluminum surfaces. Files of these classifications have an inherent tendency to clog the teeth with cuttings



ROUND TABLE

Off to a Good Start

"Hello, Ed, come on in and rest awhile. You look as if you'd enjoyed your vacation. How did the first day back in the shop seem to you?"

"It wasn't hard to take, Al. There were a few things to straighten out this morning but, in general, everything was under control."

"How's that new welding group coming along over in Sam Evans' department? I saw Williams one day last week and he seemed to think it needed some close attention."

"He must have been thinking hard about it, Al. This afternoon he sent around a letter stating that Jim Lee, the production engineer who worked out the new set-up, will act as foreman of the group until further notice. Sam is still foreman of the department, but will report to Jim in all matters relating to the welding group."

"Not a bad idea, how does Sam feel about it?"

"I couldn't get him to say much when I saw him on the way out of the shop this evening. He seemed worried about his job, couldn't get away from the idea that Williams must think he's slipping."

"That isn't the case, Ed. I'm sure, from what Williams told me, that he thinks a lot of Sam and likes his work."

"Then why does he take part of Sam's job away and give it to a man who doesn't know anything about the department, if he thinks Sam is all right?"

"Jim does know a lot about that welding group. He has lived with it for several months in order to work out all of the details. I'll bet that Sam has no conception of what the new layout will accomplish when the bugs are worked out of it."

"Sam should be the man to do that, Al. He has directed the activities of that department for almost fifteen years and certainly deserves some consideration. Why couldn't he have been asked to consult with Jim on any problems?"

"Williams told me that he felt that

the job required more attention than Sam could afford to give, at least until such time as it was running smoothly. He has just passed the details on to a specialist and will probably give it back to Sam in the near future."

"What does Jim know about the men and their individual capabilities? He will have that place in an uproar within a week."

Should the foreman or the specialist work out the technical details of a new group? Is it necessary that he be placed in charge of the department to do this?

DISCUSSION

Rolling Stones

When a man leaves a shop of his own accord it is almost invariably because he wants to better himself and a few intimate shop mates are given the full particulars. Before long most of the shop knows all about it, with the result that some of those remaining feel that they are missing something. It has always been a great source of satisfaction to me to have an opportunity to re-hire such a man. The psychological effect of such an action on the men who remained in the shop cannot be estimated.

The steady workman who remains in one shop for year after year soon becomes a fixture and eventually is mired in a rut. He knows only the way things are done in his particular shop. Traveling from shop to shop, the "rolling stone" broadens his experience and acquires many new ideas. His return to the old shop is the equivalent of introducing new blood into the organization.

Both types of men have their value and it takes both kinds to round out a successful shop organization. A shop composed entirely of steady workmen will eventually become antiquated and die of dry rot. On the other hand, a shop hiring only "rolling stones" would go into bankruptcy trying out new ideas.

The old saying that the rolling stone gathers no moss is certainly true, but I like the addition "that it does get a fine polish." I would advise any young man to be a "rolling stone" for the first ten or fifteen years and then settle down.

—OSCAR E. KOEHLER
Chief Engineer
Greenfield Tap & Die Corporation

In the long run, the man who stays in a shop year after year is of more value than the "rolling stone". Such a man is well acquainted with the type of work required and knows, through experience, just how to handle the job assigned to him.

There are, however, exceptions to this rule. It must be admitted that the man who drifts from shop to shop has an opportunity to see different methods in use and to store up in his mind many kinks that will serve him well in the future. The fact that he is a "drifter," however, leads one to conclude that he doesn't store up these kinks and that there must be some good reason for his shifting around from one shop to another without staying long in any one place.

It seems that Bill Harris is not a true representative of the average type of "rolling stone". From the fact that he had a difference of opinion with Al, we are lead to believe that he has a mind of his own and that he makes use of it; possibly not always diplomatically. A "yes" man is of no value in any shop and I like a man who has ideas of his own and has the courage of his convictions.

Bill Harris is one of those rare men who keep their eyes open and store up ideas in their head. For this reason he is a valuable man who can produce more and better work. The only way Al, in his small shop, can build up his organization is by hiring the "rolling stones" that drift into his plant. After they are there, it is up to Al to give them the kind of a deal that will influence them to become steady, dependable workmen. —ROGER C. DICKEY

New Man

Taking a new man through the plant should never be regarded as a waste of time by anyone with an eye to the future. Such a practice should serve to produce more efficient workers and can be done without disturbing shop routine

Generally speaking, a new man is left to feel his way about and is soon forgotten, unless he makes a mistake. The man who is familiar with the shop and can be counted on to fill another's shoes, should an emergency arise, will soon prove his value. —G. MCARDLE

I highly commend Al's purpose in making the workmen familiar with the requirements of the parts they are making. However, a lot of time can be wasted in explaining each detail to every workman.

Why not make the set-up men and assistant foremen familiar with all operations performed on the parts? These men, having direct contact with the problem of securing the necessary output, will be able to make good use of such knowledge and direct the men under them more efficiently.

Cooperation between departments can be improved by such an arrangement. Too-conscientious workmen and "sloppy" workers can be supervised to better advantage when the men directing their activities thoroughly understand the purpose of the parts being manufactured.

—ALFRED O. BLUMENTHAL

Believe in Signs

Unquestionably, Al is right in his judgement that the display of safety signs in the shop should not be overdone. When these signs are displayed on, or around machinery and equipment that are not especially hazardous, it lessens the effect of warning at really dangerous points.

Exceptionally dangerous machinery, equipment and work places should, however, be called to the attention of workmen by suitable posters placed in conspicuous positions. The word "Danger" is very effective on warning signs and, as a rule, dramatic or pictorial signs should be avoided. Such signs tend to detract the workmen's attention from the quick warning that the plain danger sign is intended to convey. The workman is apt to look at the picture, forgetting the real warning for the time being.

When it is necessary to add other words to the simple "Danger" sign, the wording should be as brief as possible and very much to the point; otherwise, the effect of the warning will be lost. Letters on such signs should be of sufficient size to be readily distinguished by an approaching workman before the danger zone is reached. Safety signs that are visible from both sides should have the warning printed so that it can be read from both directions.

Employers who adopt systematic methods of recording and compiling accident statistics and then exhibit such records in prominent positions in the shop are, I believe, pioneers in industrial accident prevention. —A. EYLES
St. Albans, Hartsfordshire, England

Dramatic posters and persistent messages harping on dangers defeat their own object. Undoubtedly the psychological effect is the reverse of that intended. Recently we had a National Safety Week, during which the dangers of the roads were brought home to us by all modern means. Our foolish acts were shown to us at every film show, the radio blared out warnings and the newspapers featured gruesome photographs of automobile wrecks. The result? Well, statistics published during the next week showed that accidents had reached a new high level.

Maybe that was just coincident, but I think not. Over-emphasis made everyone nervous and jumpy and the consequent indecision added greatly to the deadly toll. Experience has shown that the effect in the workshop is exactly similar. A nervous workman is apt to be involved in frequent accidents.

In our own shop, we favor Al's plan of not dramatizing safety efforts. When we find operators neglecting the various safety precautions, our safety engineer does not paint a gory picture of the dangers, complete with harrowing details. He merely fixes up all the gear and, in an unobtrusive way, emphasizes firmly that all regular safety measures must be obeyed. He makes frequent visits to every department, paying special attention to grinding machines and power presses.

Not only are the machines given attention, but the actions of the operators, so that any stupid or foolhardy movement can be readily stopped.

Considering the nature of our shop, our three years freedom from anything worse than minor abrasions or lacerations is an excellent endorsement of Al's policy of "No Signs". —ROY VERNON WADE
Scotstoun, Glasgow, Scotland

Private Lives

Personal questions seldom secure reliable answers and most men resent their being asked. These questions are, to a large extent, useless as they do not affect a man's working capacity. Some firms take too great a personal interest in their employees, with the result that they have lost men and good men hesitate to apply for employment.

A foreman's judgment of men is the most reliable guide to their general character. Application blanks are of value only as a rough guide, as it is easier to write down misleading replies than it is to submit to questioning. Many firms employ a psychologist who is able to judge whether replies to questions are due to bluff or to nervousness.

—W. E. WARNER
Sompting, Sussex, England

Elevated Vise Jaws for Milling Operations

These jaws have the advantage of simplicity, and it is easy to apply to them the clamps, equalizers and centering devices already described

C. W. HINMAN
Tool Engineer
Kobzy Tool & Electric Manufacturing Company

ONE TYPE of an elevated pair of milling jaws is shown in Fig. 142. The elevated portion extends above the top of the vise. Space *A* is a clearance notch for inserting and removing the pieces. Elevated jaws are made proportionally greater in thickness to add necessary strength because of their extra heights.

Another type of elevated jaws is illustrated in Fig. 143. Finger space *A* is located at the center of the jaws. Note that the smaller milling cutter, for corner notching at the right, is set partly within the larger cutter. This insertion insures a cleaned-up cut at the corresponding corner on the work.

The pair of jaws represented in Fig. 144 has double elevations, and holds two pieces for angular milling their ends parallel. A gang of four side milling cutters is used. The finished pieces are ejected by gravity by simply opening the vise far enough to allow them to clear burrs when dropping between the jaws onto angles *A*. The angles are a solid part of the stationary jaw and project in front of it. Chutes are arranged at the sides of the vise which lead the finished pieces into pans.

In the two foregoing cases, the blanks are inserted between the jaws by hand. It is not difficult to locate the pieces symmetrically, lengthwise by hand, so that approximately the same amount of metal is cut from each end. The blanks project from the jaws, only about $\frac{3}{64}$ in. at each end, and this amount can be quickly equalized by the "feel" between thumb and fore-finger. When a stop gage is necessary for quantity production, it is hinged on the stationary jaw, and after using it, a spring throws it back to clear the cutters. At other times, a vertically sliding pin, actuated by a spring, is used for the purpose. After using this stop, the spring forces the pin below the path of the milling cutter. The pin is raised into gaging position by an attached trigger.

Milling Five Surfaces

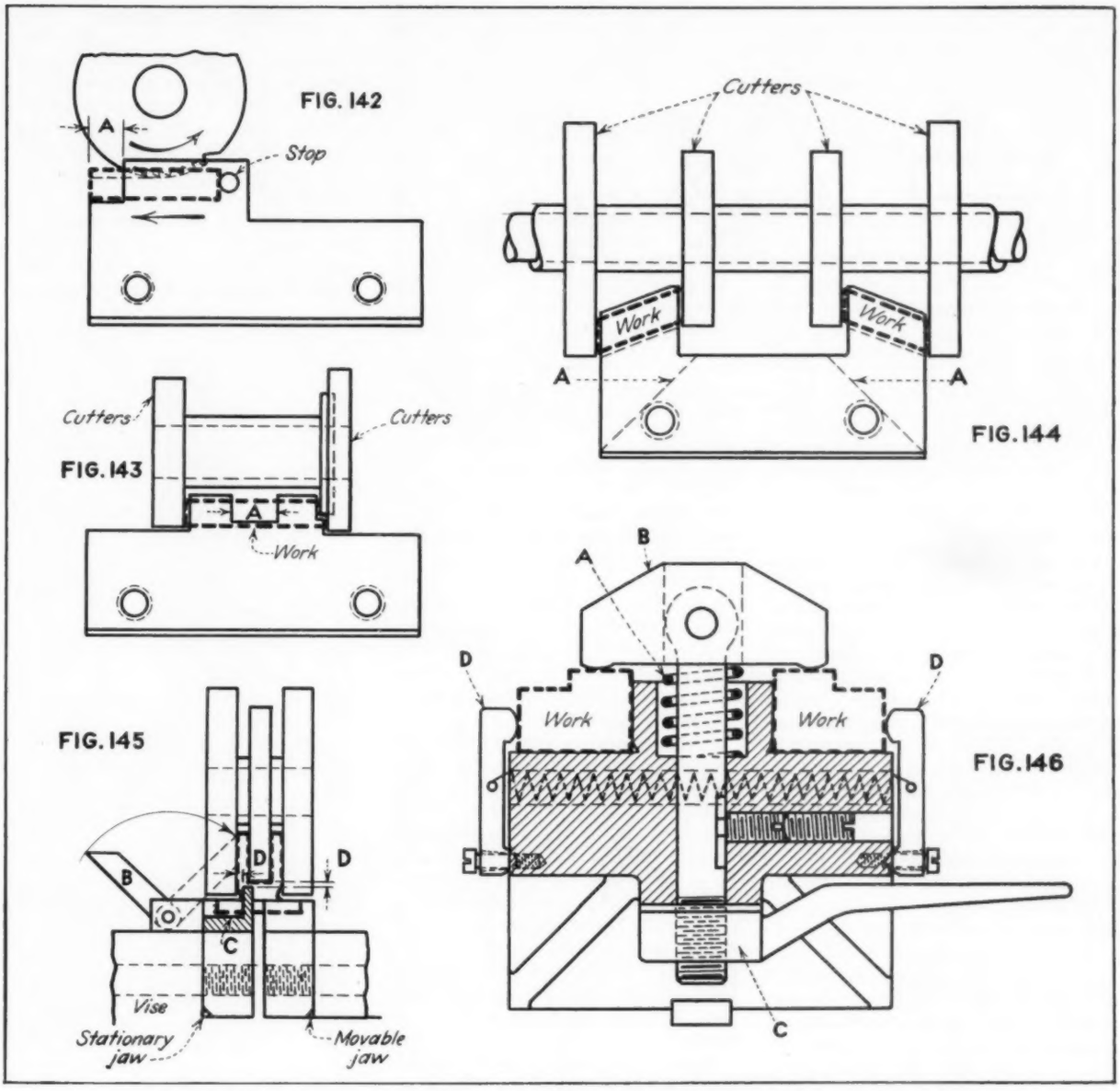
Fig. 145 represents an end view of a pair of elevated jaws at the center of which are counterbored arcs for holding the cast yoke, and for milling five surfaces by using a gang of three milling cutters. The work has been previously finished turned, on its base and edge, by a hand screw-machine operation, and the vise jaws register from these surfaces.

It is unnecessary in this case to use centralizing jaws because, if the initial set-up is right, it is obvious that the milled surfaces will be central with the finished base circumference from which the piece is registered. It *is necessary*, however, to align the yoke sides parallel with the jaws and cutters before closing the vise for milling. This is accomplished by using the swinging blade *B*, attached in a projection at the left of the stationary jaw. This blade is shown by dotted lines in aligning the work before clamping, and by full lines when thrown back after clamping, to clear the milling cutters.

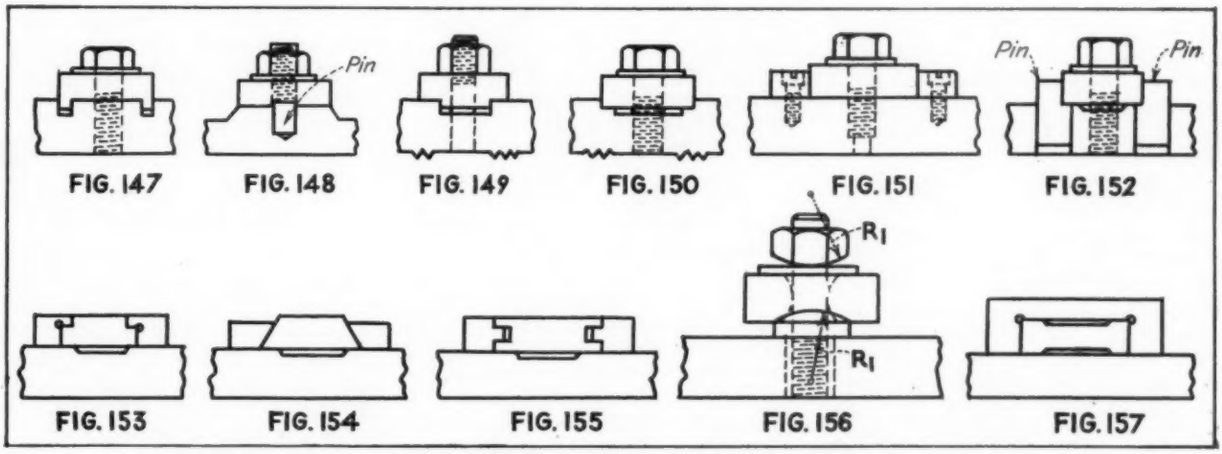
Angle *C*, attached on the stationary jaw, is called a "feeler gage." By its use, the correct position of the table and vise, in relation to the cutters, can be readily determined, so that the first piece will be milled right. In using this gage there is avoided the usual mis-cutting and spoiling of several pieces when attempting to make the first cuts without it.

The gage is located so that, for correct milling, both the vertical and horizontal openings *D* are 0.0625 in. spaces. The machine setter tries an 0.0625 in. thick "feeler blade" in the spaces between the gage and cutters. If necessary, he moves the table to suit the gage, until the vertical and horizontal location of the vise is properly determined before any cuts are made. The table is then locked in correct position and the job is ready to run.

The dimensions for correctly attaching the gage in relation to the points of work registry are given by the tool engineer. A "feeler gage" is an indispensable attachment on



Figs. 142-146—Some work can be located in the jaws by hand, but more often quantity production requires a stop gage, a pin, a swinging blade or some other device



Figs. 147-157—These eleven methods of guiding clamps, slides and thrust types of milling supports give the tool designer wide latitude and may be readily adapted to his purpose

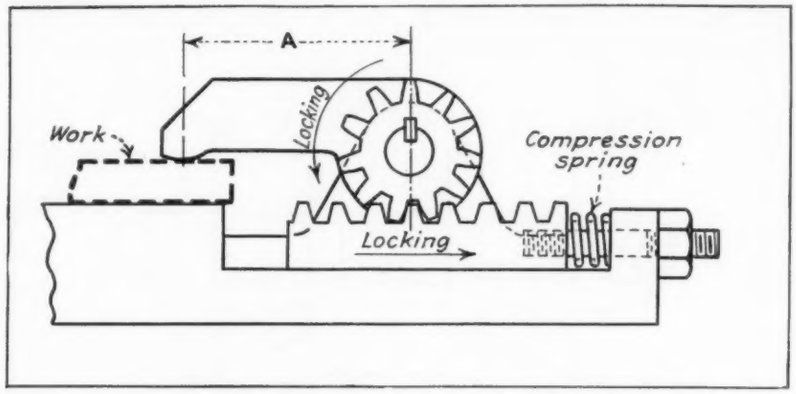


Fig. 158—Racks may be applied horizontally, vertically or at an angle to the clamp to suit the work piece or desired compactness

any milling fixture, because it saves time and waste. Instructions are stamped on the tool: "Use $\frac{1}{16}$-in. feeler gage."

Clamps and supports for heavy work in large milling fixtures operate on the same principles as in smaller fixtures. Both large and small fixtures usually have cast-iron bodies, the larger ones being extensively ribbed and designed with comparatively light webs between the ribs. This feature increases strength and reduces weight and cost. The surface cuts on any cast-iron body should be as few as possible, because the maximum strength in cast iron lies mostly in its "skin." To machine off the skin sacrifices considerable strength. Cast-iron castings seem to cure with age.

An equalizer, eye-bolt and nut lever clamps and releases two pieces of work in Fig. 146. Coiled compression spring *A* raises and releases equalizer *B* from the work when nut lever *C* is loosened. The sketch represents a cross-section at right angles through the center of the fixture. Two opposed "floating clamps" *D*, causes a side registry of the pieces before clamping. If the work is long, four or more opposed clamps are used. A tension spring is shown attached to each of the clamps, and passes through a clearance hole in the fixture.

If the work is too long for a single-unit fastener, two or four of such units are used, and operated underneath by a compound equalizer bar mounted under a centrally positioned nut. For quick action, a flat-faced cam can be substituted in place of the nut. For positioning the milling table and fixture in reference to the cutters for making the first cuts, a steel gage of the same cross-section as the finished piece is used, or a "feeler gage" can be attached on the fixture for the purpose. The simplest "feeler gage" is a vertical pin driven in the fixture, with a flat provided on it which faces the cutter for gaging.

Figs. 147 to 157 inclusive show eleven rear-end views of conventional methods for guiding clamps, slides and thrust types of milling supports. By referring to these principles, a suitable design is often found or suggested.

The rack and pinion principle for clamping is sketched in Fig. 158. Racks and pinions have been successfully applied in many types of tools and machines. They are used in jigs, milling and assembling fixtures, dies and special machinery. This is one of the most dependable movements known in mechanics. It is an inexpensive design because many sizes of racks and pinions have been commercially standardized and can therefore be economically purchased.

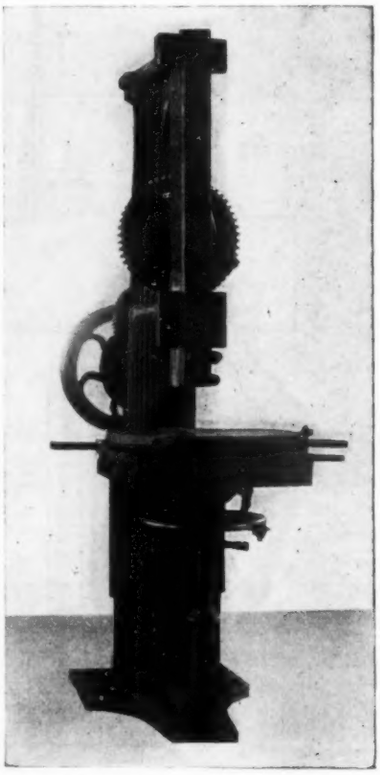
Racks and pinions have several applications in clamping. The type shown uses the rack in a horizontal position, but it could be vertical to the clamp, or positioned at convenient angles relative to the clamp. This is often necessary in suiting the shape of the work piece, or for making a compact tool design. For efficient holding power, dimension *A* on the clamp should not exceed the pitch diameter of the pinion more than about $1\frac{1}{2}$: 1. The conditions shown in the sketch are sometimes advantageously reversed; that is, the rack end becomes the supporting member, and is advanced or withdrawn by rotating a handle arm attached to the pinion. In this case the handle must be positively secured in its locked position by using a suitably placed clamp, cam or key.

Part XIX of Mr. Hinman's series on tool design will appear in an early number.

Shipyard Slotter

Fluted columns had their day as the acme of elegance in machine design. Whether the question of added strength due to the numerous ribs was considered, is very doubtful. Appearance was probably the only consideration.

The date of the slotter shown is not certain but it probably was of pre-Civil War vintage. The name plate is Warren & Whitney, Nashua,



N. H. but bears no clue as to age. It is supposed to have come from the Harrison Loring shipyard in South Boston, Mass. and to have been used in helping to build the first steel ships. It is now in the shop of the Perkins Machine Co. at Warren, Mass. but is not typical of their other machine equipment.

Beer Dispenser

According to *Industrial Bulletin*, a Sheffield firm, Clement Garrett & Company, Ltd., is manufacturing an automatic machine for selling bottles and cans of beer. One of these units has been installed in a London bar. It is claimed that previous attempts in other countries to manufacture such a machine have been unsuccessful.

IDEAS FROM PRACTICAL MEN

Form Tools for Grooves With Half-Round Bottoms

N. V. SMITH
President, Smith-Johnson Corporation

In making form tools for turning or planing grooves having half-round bottoms of any given radius, a great saving can be made in the time of cutting the grooves if the form tool is made with what we have termed a spherical rake. This is especially true where radii from $\frac{1}{16}$ to $\frac{1}{2}$ in. are to be formed in the screw machine, using tools such as the one shown in Fig. 1 in the cross-slide.

In developing the spherical rake, the general procedure is first to force an ordinary steel ball into the annealed tool blank. The ball should be of such diameter as will give the proper rake when it has been sunk into the tool blank far enough to make a depression diameter equal to the width of the groove to be cut.

To determine the diameter of the ball to be used and the depth to which it is to be sunk in the tool blank, these formulas may be used:

$$D = \frac{d}{\sin A}$$

$$d = D \times \sin A$$

$$b = 0.5\,d - (0.5\,d \times \text{cosin } A) \text{ or}$$

$$b = \frac{D \sin A}{2}\left(\frac{D \sin A}{2} \times \text{cosin } A\right)$$

Where:

D = Ball diameter,
d = Width of groove to be cut,
A = Predetermined angle of top rake, and
b = Depth to sink the ball.

First solve for D and select a steel ball of the nearest commercial size. The difference between the commercial size and the size as figured may change the rake angle somewhat, but not enough to be serious. Then solve for b, the depth to which the ball is to be sunk in the tool blank. Force the selected ball into the annealed tool blank, preferably in a hydraulic press, until it is a few thousandths deeper than the figures call for. Rough grind the tool to the approximate radius and harden it. The top surface of the tool should then be ground in a surface grinder until the depth of depression made by the ball reaches the calculated amount.

Referring to Fig. 2, a hole is drilled near the edge of a steel plate and slightly less in diameter than that of the ball used to make the depression in the tool. Force the ball into the hole until part of it projects above the plate to the same height as the depth of its depression in the tool. The plate with the ball in place is clamped to the grinder table with the ball preferably supported by shims as shown. The table is tilted to the predetermined clearance angle and the tool is placed face down on the plate with its spherical depression engaging the ball.

Thus positioned, the tool is fed into the face of a cup wheel until the correct radius of curvature is reached. Then the tool is oscillated about the ball as a center and the clearance is ground 180 deg. around the end of the tool. If the groove to be cut in the work is much deeper than the radius at the end of the tool, it will be necessary to grind the clearance slightly more than 180 deg. for ample side clearance.

The methods described may not be accurate to the proverbial "tenth," but then neither are screw machines accurate within such a tolerance, and we are aiming only to decrease the time of cutting where a large quantity of grooves are to be cut.

Variations of these methods may be used for tools for boring metals, and particularly for forming the shapes of cutter heads for woodworking shapers.

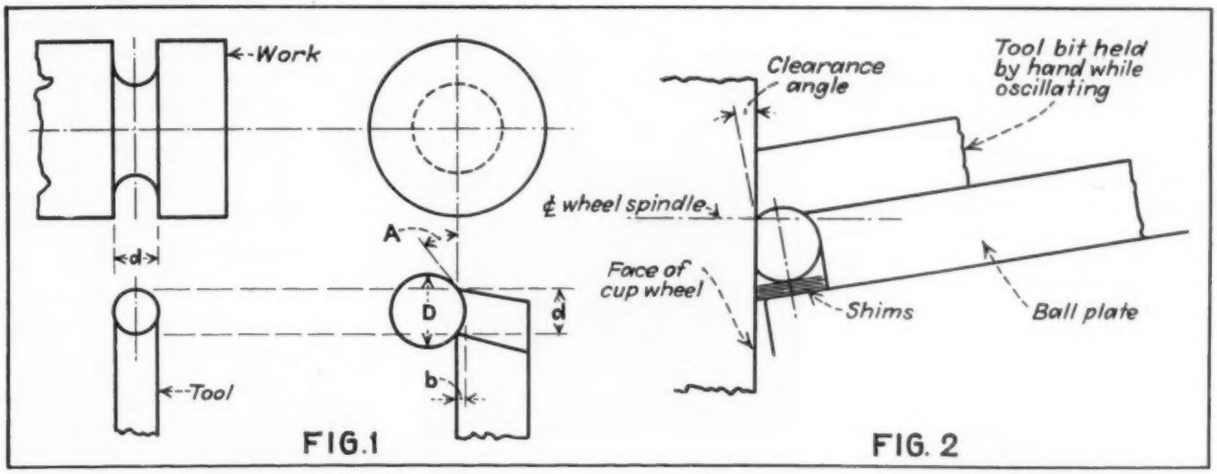


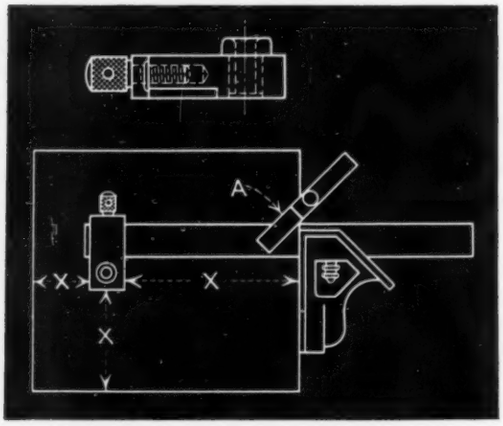
Fig. 1—A steel ball of the correct size according to the formula given is forced into the tool blank to form the top rake. Fig. 2—The tool is ground to the correct radius by placing it face down on a ball and oscillating it 180 deg. against the face of a cup wheel

Hole-Spacing Attachment

PETER L. BUDWITZ

The attachment illustrated will convert a combination square into a convenient tool for spacing and drilling holes in various kinds of tool work. The construction of the attachment, in which drill bushings are used as guides for drills, reamers and counterbores, is plainly shown. The bottom is machined to fit the blade of a combination square, to which it is clamped by a knurled-head screw. The hole in the bushing is ground to fit the outer diameter of a standard-size toolmakers' button.

Center distances for the required hole locations can be conveniently measured by size blocks or other measuring tools. When properly located on the work, the attachment is held by a clamp, as at *A*. To make hole-spacing calculations easy, the distances from the center of the hole in the bushing to the outer measuring points of the attachment are equal and of some convenient dimension. They must be added to the dimensions *X* to center the bushing on the location for the hole.



With the attachment clamped to the blade of a combination square, locations for holes can easily be found. It can also be used for locating toolmakers' buttons

An accurately made attachment will facilitate setting toolmakers' buttons when the nature of the work demands their use. After the hole for a button screw has been drilled and tapped, the attachment is located on and clamped to the work. The button is then inserted through the hole in the bushing and is secured by its fastening screw. The attachment can then be readily removed, thus making an otherwise annoying job comparatively simple.

The blade of a combination square and the attachment can be used in connection with a protractor head when various location points are given in degrees.

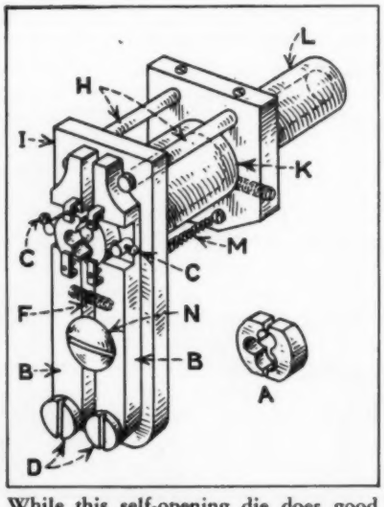
The attachment is hardened and ground all over. Drill bushings in a variety of sizes will increase the usefulness of the attachment greatly.

Ingenious Self-Opening Die

CHARLES H. WILLEY
Superintendent of Manufacturing, Hoyt Electrical Instrument Works

Every so often some mechanic makes a device, feeling that he has got something of value. Evidently that was what occurred in the case of the self-opening die illustrated. The originator must be given credit, for the tool does a very good job in so far as its use is possible. Its faults lie in its bulkiness and its inability to thread work close to a shoulder. However, it is shown for its unusual design.

The tool employs a standard button die which is split in halves and ground parallel on its top and bottom, as shown at *A*. The halves are mounted in slots in the arms *B* and are held by clamps. They are adjusted for diameter by the screws *C* in the posts at the outer ends of the slots. The arms are pivoted on the shouldered studs *D*. Spring *F* opens the die when arms *B* are pulled clear of the locking pins *H* by the die continuing to thread the work after the turret has come to a stop. When the die is closed, these pins just come through the plate *I* on which the arms are mounted. Plate *I* is attached to the sleeve *K* which slides on the hollow shaft *L*. The pull spring *M* keeps the die closed when reset until it is again released. The large, thin, mushroom-head screw *N* keeps the arms in place.



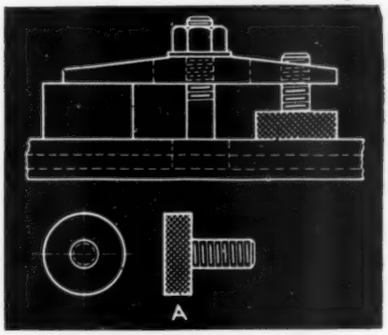
While this self-opening die does good work, its faults are that it is bulky and that it will not thread work close to a shoulder

Adjustable Clamp Heels

C. F. FITZ

Frequently when we had work that had to be clamped, we had to hunt for heel blocks of the proper size. Many times we could not find suitable blocks and had to make them.

We have eliminated that trouble by drilling and tapping ½-in. holes in the heel ends of all our strap clamps and making screw heels as shown at *A*. The heels are made from 1½-in. round stock, having the threaded parts to fit the tapped holes in the clamps. The heads are knurled for a good finger grip in making quick adjustments and the threaded parts are made in different lengths to suit various jobs. We are able to get a very wide range of adjustment of the clamps with these heels, and they certainly save a lot of time.

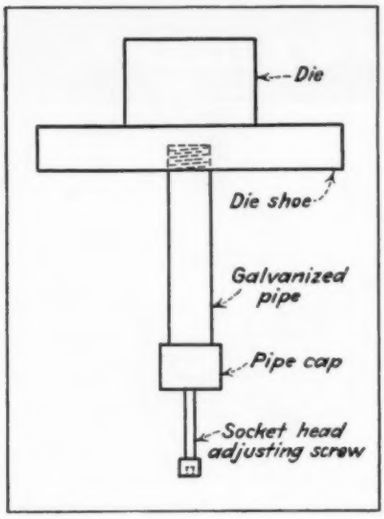


Adjustable heels for clamps save time of hunting heel blocks and provide a wide range of adjustment

Pipe Inclosure for Knockout Spring

H. R. LE GRAND

Simple press tools built with an eye to economy are the rule in shops where production on any one item is limited. In a jewelry manufacturing establishment, small foot press dies requiring knockouts are fitted with the inclosure illustrated for the knockout spring. The pipe and cap make a very satisfactory inclosure and are

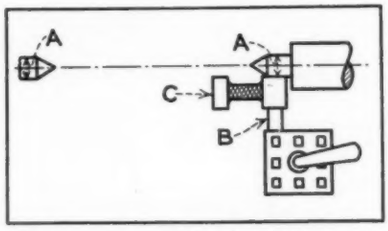


readily put together at little expense. The socket-head screw at the lower end adjusts the spring action.

Lathe Centers Aligned by Eccentric Collar

R. G. HEWITT
Huddersfield, Yorkshire, England

The method of aligning lathe centers described by H. Moore in an article under the above title (*AM*—Vol. 81, page 617) is far from satisfactory, since accuracy is dependent



With a square-ended bar held in the toolpost, the centers can be aligned by using a plug gage between their bodies and the end of the bar

upon keeping the collar firmly located on the centers by hand.

A simpler and more accurate method is illustrated, in which it is first necessary that the bodies *A* of the centers be straight and accurately of the same diameter. For aligning the centers, a flat-ended bar *B* is held in the toolpost and is moved forward until the plug gage *C* will pass between it and body of the headstock center with a certain "feel." The carriage is then traversed to bring the bar opposite the body of the tailstock center, which is adjusted until the gage will pass between them with the same "feel." The centers can be aligned rapidly by this method.

Tinting Sections

A. W. EIDMAN

On routine production drawings where considerable section cross-hatching must be done, time can usually be saved by tinting these areas with an ink that will show as an intermediate tone on the blueprint.

Washes of india ink shrink linen and vellum tracings and are slow to dry. An ideal ink for the purpose can be made by dissolving a small amount of any red or brown aniline dye in denatured or wood alcohol. Aniline dyes in various colors and coated on paper sheets for use in coloring photographs can be bought in any photographic supply store and will answer the purpose admirably.

The dye ink spreads well with a brush on linen and paper and dries very quickly. A second wash over the first will materially darken the tint. Two inks of different densities can be used to show adjoining sections.

Riveting Hammer Used for Coining

LESTER MENGEL
High Speed Hammer Company, Inc.

Coining is generally done in toggle presses because of the enormous power required, but small work can be very nicely done in the high-speed type of rubber-cushioned, hickory-helve hammers by the use of dies like those illustrated.

The lower die is attached to the anvil block of the hammer, but the upper die is loose and is placed on the work *A* by the operator, being guided by a simple V-block extending from the side of the hammer. The shank of the upper die is knurled for ease in handling.

A simple hardened peen *B* is carried in the ram and is suitable for hammering on top of the upper die. The resiliency of the blow from this type of hammer imparts the same

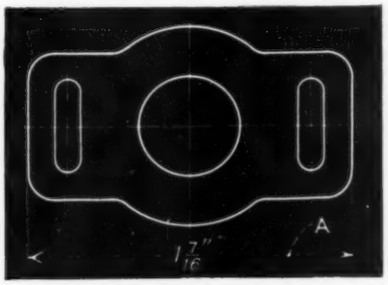


Fig. 1—The work coined in the riveting hammer is 1/16-in. thick steel and the coining time is approximately 5 sec. for each piece

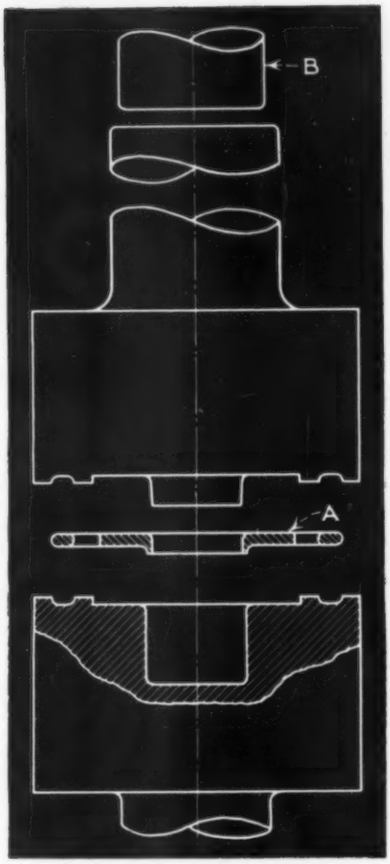


Fig. 2—The upper die is not attached to the ram, but is placed on the work *A* by hand, being guided by a V-block

type of flow to the cold metal in coining that is obtained in cold riveting. The only change in the machine for coining instead of riveting is that the peen-rotating mechanism is locked against rotation.

The part coined is made of $\frac{1}{16}$-in. thick steel and the coining time is approximately 5 sec. for each piece.

Attachment for Grinding Concave or Convex Rolls

J. R. WHITTLES

Standard cylindrical grinders come equipped with a taper attachment but without a forming attachment for grinding small rolls. Often some strange methods are used to grind convex or concave surfaces on rolls in manufacturing plants not equipped with roll grinders, and that is why this forming attachment has been designed. It is suitable for work on rolls up to, say, 24 in. long and under 1,000 lb. in weight.

To operate satisfactorily, the forming attachment must swing the swivel table about the center of the swivel provided. The attachment can be

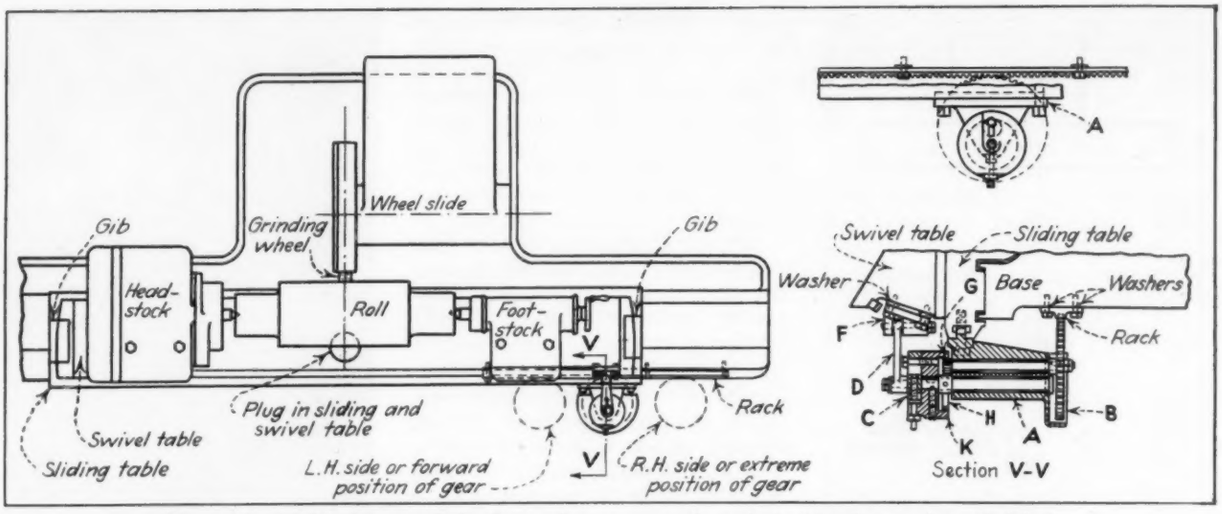


Fig. 1—A gear-driven eccentric in the attachment causes the swivel table of a regular cylindrical grinder to swivel so that either convex or concave surfaces can be ground on short rolls

placed at the right- or left-hand end of the table, according to the space available on the grinder. It is easy to change from concave to convex grinding and for straight grinding it is only necessary to centralize the eccentric and to clamp the gibs on the swivel table.

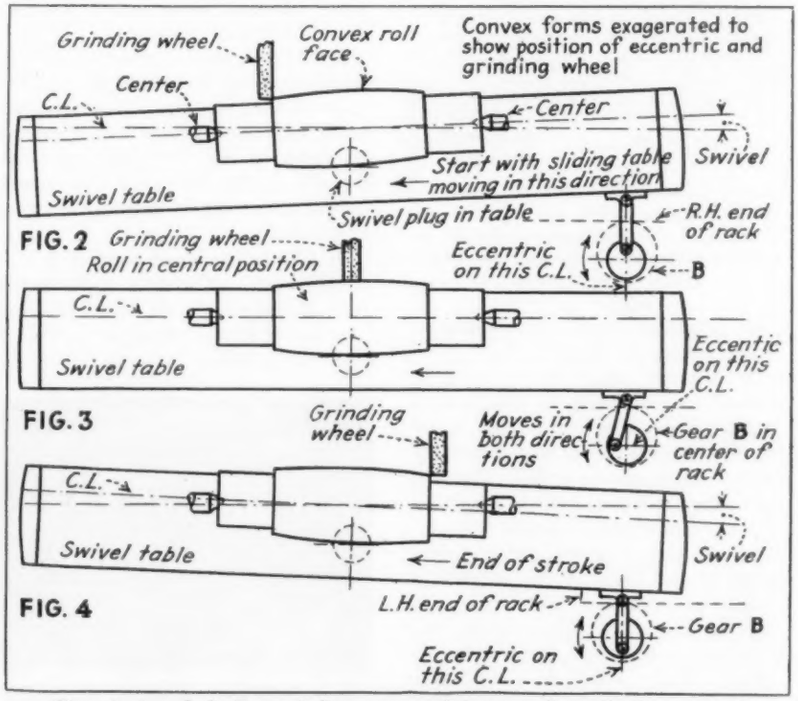
Power for driving the attachment is received through the following mechanism: main bracket *A* is fastened to the sliding table and swivels with it. This bracket carries a spur gear *B* that meshes with a stationary rack bolted to the machine base. The eccentric *C* is adjustable for changing its throw and is connected to the swivel table by the crank arm *D* and the bracket *F*. Eccentricity of *C* determines the throw of the swivel table.

The method of operation is as follows: In traversing the sliding table and bracket *A* in either direction, *B* is caused to rotate. Gear *B* revolves pinion *G* which drives the internal gear *H* and oscillates the eccentric body *K* a maximum of one-half revolution. Gear *B* revolves two revolutions in traveling 60 in. for grinding a roll face of 30 in. in length. It has 96T-10P whereas pinion *G* has 11 teeth and internal gear *H* has 44 teeth.

For convex grinding the roll is placed between centers as shown in Fig. 2 and the swivel table is moved over so that the roll face is in position for the grinding wheel to start the convex form. The crown except for large rolls, is seldom over 0.015 in. The eccentric is shown at the end of its stroke and gear *B* has traveled to the extreme right-hand side of the stationary rack. This will occur only on the maximum stroke or width of roll face. The eccentric rotates in either direction, indicated by arrows and only 180 deg. of its rotation is used for controlling the swivel table when grinding convex roll faces. The other half of the eccentric is for grinding concave rolls.

When the roll is in the central position, Fig. 3, the grinding wheel is also in the center of the roll. The eccentric has moved to a central position and the rack gear is in the center of the rack. Fig. 4 shows the eccentric at the other end of its stroke with the grinding wheel at the other end of the roll face and the rack gear at the left-hand end of the rack. The grinding wheel has completed the curve and the table and eccentric are in position to return its stroke as the table reverses.

In changing over to concave grinding it is necessary to advance the eccentric 180 deg. with the positions the same as illustrated for convex grinding. The eccentric is advanced to keep it rotating in proper relation to the roll.



Figs. 2, 3 and 4—For grinding convex forms on the roll, the eccentric operates in the third and fourth quadrants, whereas when concave surfaces are to be ground, the eccentric must be advanced 180 deg. so as to operate in the first and second quadrants

Shop Measurement of Plated Coatings—II

THE CHORD method of measuring the thickness of plated coatings was first reported by F. C. Mesle of Oneida Ltd. Later his method was enlarged by Wm. Blum and Abner Brenner of the National Bureau of Standards. Their method (*AM*—Vol. 80, page 773) entailed the use of a 4-in. grinding wheel for cutting through the plating, but with the limitation that "For coatings less than 0.0002 in. thick the method is not very accurate." Since then Mr. Mesle has adopted a curved file of 10 in. radius and a small bench fixture for making the test. The larger radius improves the accuracy of measuring the chord which is now 2½ times greater than obtained with a 4-in. wheel. Thus, a thickness of 0.00005 in. can be measured with fair accuracy.

The fixture is mounted on desk or bench. The end of the curved file is placed between two rollers set at an angle and close enough together so that no free play is permissible when the file is used. One hand is used to hold the end of the file that protrudes through the rolls and the other hand is placed on the file handle and pressed downward as well as forward. Thus, the file is constrained to move along a curved path of 10 in. radius. The accompanying illustration shows the type of cut made in the plated coating. Width of the chord at *W* is measured and the weight of metal plated per square foot of surface can be obtained from the table. This table also gives the equivalent thickness in inches. Note that for very thin platings the file does not cut continuously across, but makes two widely spread cuts that approach circles as the plating thickness decreases. The base metal is visible at the center of each cut, and *W* is measured as in Fig. 2.

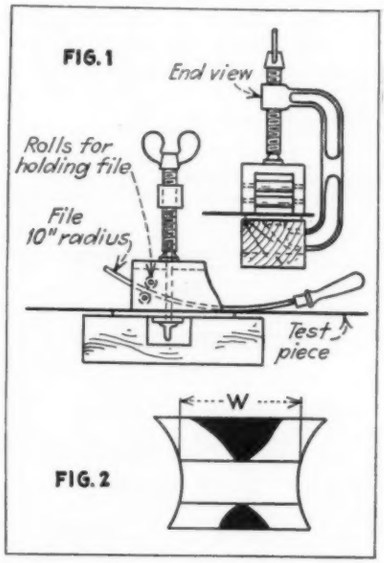


Fig. 1—Fixture for holding file when making chord measurement of plating thickness by Mesle method

Fig. 2—In this outline of a file cut, the black areas represent base metal, the light area the plating that has not been cut through by the file

Thickness and Weight of Plating—File Test Method

Width of Chord	*Thickness in Inches*	*Weight of Metal Plated per Sq. Foot of Surface*						
		Dwt. Silver	*Dwt. Gold*	*Oz. Nickel*	*Oz. Copper*	*Oz. Zinc*	*Oz. Cadmium*	*Oz. Chromium*
0.025	0.000008	0.13	0.23	0.006	0.006	0.005	0.006	0.005
0.037	0.000017	0.27	0.50	0.012	0.012	0.010	0.012	0.010
0.050	0.000031	0.50	0.90	0.023	0.023	0.018	0.022	0.018
0.062	0.000050	0.80	1.46	0.036	0.036	0.029	0.036	0.029
0.075	0.000070	1.12	2.04	0.051	0.051	0.040	0.050	0.040
0.087	0.000096	1.53	2.80	0.070	0.070	0.056	0.068	0.056
0.100	0.000125	2.00	3.65	0.091	0.092	0.073	0.089	0.073
0.112	0.000160	2.56	4.67	0.117	0.118	0.093	0.114	0.093
0.125	0.000195	3.12	5.70	0.142	0.143	0.114	0.139	0.114
0.137	0.000236	3.77	6.88	0.172	0.173	0.138	0.169	0.138
0.150	0.000281	4.50	8.20	0.205	0.207	0.164	0.202	0.164
0.162	0.000331	5.29	9.63	0.241	0.243	0.193	0.236	0.193
0.175	0.000383	6.13	11.18	0.280	0.282	0.228	0.274	0.228
0.181	0.000439	7.02	12.81	0.321	0.323	0.256	0.314	0.256
0.200	0.000500	8.00	14.60	0.366	0.368	0.292	0.357	0.293
0.212	0.000565	9.04	16.48	0.413	0.415	0.330	0.404	0.330
0.225	0.000646	10.34	18.85	0.472	0.475	0.377	0.462	0.377
0.237	0.000705	11.28	20.57	0.515	0.515	0.412	0.504	0.412
0.250	0.000781	12.50	22.79	0.571	0.574	0.456	0.558	0.456
0.262	0.000861	13.77	25.12	0.630	0.633	0.503	0.616	0.503
0.275	0.000945	15.12	27.58	0.691	0.695	0.552	0.675	0.552
0.287	0.001033	16.52	30.14	0.755	0.759	0.603	0.739	0.603
0.300	0.001125	18.00	32.83	0.823	0.828	0.657	0.805	0.657
0.312	0.001220	19.52	35.60	0.894	0.898	0.713	0.873	0.713
0.325	0.001320	21.18	38.60	0.966	0.975	0.785	0.945	0.785
0.337	0.001423	22.76	41.53	1.04	1.05	0.837	1.02	0.837
0.350	0.001531	24.50	44.68	1.12	1.13	0.895	1.09	0.895
0.362	0.001645	26.32	48.00	1.20	1.21	0.960	1.18	0.960
0.375	0.001757	28.11	51.24	1.28	1.29	1.02	1.26	1.02
0.387	0.001877	30.03	54.78	1.37	1.38	1.10	1.34	1.10
0.400	0.002000	32.00	58.37	1.46	1.47	1.17	1.43	1.17
0.417	0.002180	34.88	63.65	1.59	1.60	1.27	1.56	1.27
0.425	0.002257	36.11	65.87	1.65	1.66	1.32	1.61	1.32
0.437	0.002392	38.27	69.81	1.75	1.76	1.40	1.71	1.40
0.450	0.002531	40.50	73.68	1.85	1.86	1.48	1.81	1.48
0.462	0.002673	42.76	77.01	1.95	1.96	1.56	1.91	1.56
0.475	0.002820	45.12	82.30	2.06	2.07	1.65	2.02	1.65
0.487	0.002970	47.52	86.67	2.17	2.18	1.73	2.12	1.73
0.500	0.003125	50.00	91.20	2.29	2.30	1.85	2.23	1.85
0.512	0.003276	52.40	95.61	2.39	2.41	1.95	2.34	1.95
0.525	0.003445	55.12	100.50	2.52	2.53	2.05	2.46	2.05
0.537	0.003604	57.66	105.18	2.63	2.65	2.14	2.58	2.14
0.550	0.003781	60.50	110.34	2.76	2.78	2.25	2.70	2.25
0.562	0.003948	63.17	115.22	2.88	2.90	2.35	2.82	2.35
0.575	0.004133	66.12	120.62	3.02	3.04	2.45	2.95	2.45
0.581	0.004307	68.91	125.70	3.15	3.17	2.56	3.07	2.56
0.600	0.004500	72.00	131.33	3.29	3.31	2.67	3.22	2.67
0.612	0.004681	74.89	136.61	3.42	3.44	2.78	3.34	2.78
0.625	0.004882	78.82	142.48	3.57	3.59	2.90	3.49	2.90
0.637	0.005072	81.15	148.02	3.71	3.73	3.01	3.63	3.01
0.650	0.005281	84.50	154.12	3.86	3.88	3.14	3.78	3.14

Die-Hole Layout

CHARLES WESLOW

THE BEST method I know of to drill holes in a die or jig plate, which must be spaced to within 0.0015 in. without locating buttons or the use of a jig boring machine, is described herewith.

Take, for instance, a die with four piercing holes to be bored in it. One hole is $\frac{1}{8}$ in., another is $\frac{3}{16}$ in., another is $\frac{5}{16}$ in. and the largest is $\frac{5}{8}$ in. In Fig. 1 is shown the lines of a height gage greatly enlarged. One line is cut deeper than the other, which is accomplished by scratching one line twice, while the other is scratched three times with the height gage scratcher. In Fig. 2 there is a finely pointed prick punch, which is also shown in a scratched line atop of the die in Fig. 1. It is in the shallow line, held almost vertical, and is deftly slid along the shallow line until all of a sudden it drops down into the deeper line, which is exactly where the two lines intersect. It is then driven in with a light hammer, just enough so that the second prick punch, Fig. 3, will follow it a little deeper, and if necessary it should get another whack with the light hammer, just enough so that a No. 60 drill will follow it to a depth of $\frac{1}{32}$ in. in the $\frac{1}{8}$-in. hole, $\frac{1}{16}$ in. in the $\frac{3}{16}$-in. hole, $\frac{1}{8}$ in. in the $\frac{5}{16}$-in. hole and $\frac{3}{16}$ in. in the $\frac{5}{8}$-in. hole.

These No. 60 drill holes are followed by a No. 52 drill in the $\frac{1}{8}$-in. hole to the depth of the No. 60 drill hole. A No. 42 drill follows the No. 60 drill hole in the next size, $\frac{3}{16}$ in. A No. 26 drill follows the No. 60 drill hole in the next size, $\frac{5}{16}$ in., and a $\frac{1}{4}$-in. drill follows the No. 60 drill in the $\frac{5}{8}$-in. hole. All these latter drill holes are starters for pilot drills, which are somewhat smaller than the finished sizes given. The pilot drill for the $\frac{1}{8}$-in. hole should be $\frac{7}{64}$ in.; for the $\frac{3}{16}$-in. hole, $\frac{11}{64}$ in.; for the $\frac{5}{16}$-in. hole, $\frac{19}{64}$ in., and for the $\frac{5}{8}$-in. hole, $\frac{39}{64}$ in. The pilot drill, as shown in Fig. 6, is ground to an angle of about 55 deg.

In Fig. 4 it will be seen that each hole has a square box around it, which consists merely of scratched lines from the scratcher on the height gage. These boxes are laid out when the center line of each hole is laid out, and each one measures the same as the hole to be drilled. In a drill press the pilot drill bores very nicely, and as soon as the pilot drill bores to within $\frac{1}{32}$ in. of the size, one starts to observe with a magnifying glass how near the pilot drill hole, or rather "spot", is concentric to the square box. It is easily observed where there is more surface on one side or the other, when the spot becomes a diameter close to the box lines. Because the pilot drill is ground to an angle of 55 deg. it can be shifted easily by pressing the die against the pilot drill while the latter revolves.

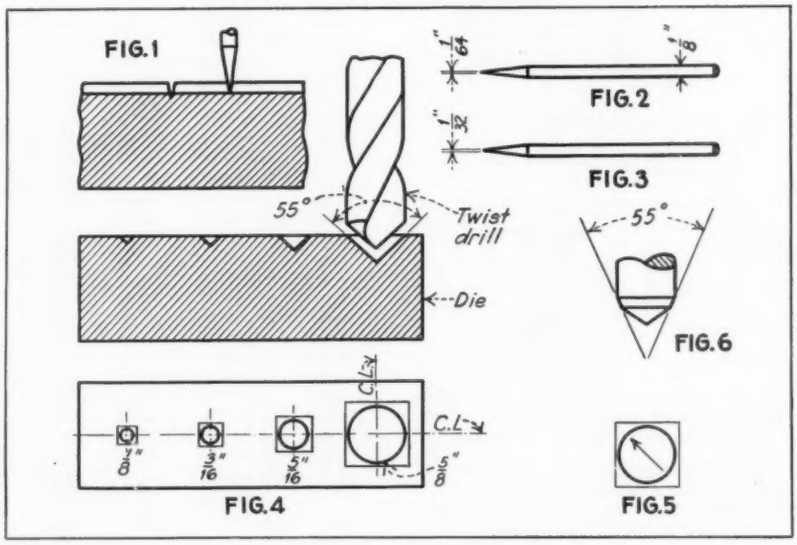
In Fig. 5 it is noticeable how the pilot drill "went" over one side too much. Don't worry, because the spot will go over in the direction of the arrow in Fig. 5, if you merely press the die against the pilot drill; the 55 deg. on the cutting edge works wonders. Finally, after several observations, you will get the "spot" to within 0.0015 in. of the center, and maybe nearer. A whole lot, of course, depends on your eyesight. If you can't observe any difference, then you can't read a vernier to within a half a thousandth. Any toolmaker who can't do that, shouldn't be a toolmaker. He should be a pretzel maker, which is about as accurate as the wag of a dog's tail.

When finished with the pilot drills, use regular drills to open the holes leaving 0.005 in. for the reaming; but the cutting edges of the reamer drills must be ground as shown in Fig. 6, otherwise they may possibly shift. You cannot expect a regular drill to follow a "spot" that is 55 deg. You will notice in Fig. 6, that only the back end of the cutting edge is ground to 55 deg., which is enough to guide it until the point of the drill starts cutting at the bottom of the 55 deg. spot.

Too much clearance on the cutting edge of the pilot drill will cause it to chatter. Yet there must be enough so that it will shift easily from pressing the spot against one side of it.

I have two sets of buttons in my kit that I formerly used in locating holes accurately, but when the tolerance is no more or less than 0.002 in. then I let my buttons sleep, and use pilot drills instead.

Pilot holes aid in making a die plate layout



INDUSTRIAL REVIEW

WHILE machinery and machine tool orders are off for the country as a whole during the first half of October, the drop is considerably more abrupt in the eastern territory than it is further away from Wall Street. Distributors of machine tools are still optimistic regarding future prospects. Manufacturers have been able to take more of the foreign orders offered because the pressure on their plants has been relieved by the drop in domestic business. Backlogs of machine tool orders are still considerable and there are not many lines where deliveries this year are obtainable. At the moment labor disturbances are a negligible factor in the machinery field. The implications of the stock market debacle apparently have not been overlooked by the labor agitators.

ALL THREE of the big eastern distributing centers, Boston, New York and Philadelphia, feel the effects of the uncertainty created by the stock market slump. Orders have dropped from much above normal to much below. Inquiries, on the contrary, have been fairly well maintained. Both orders and inquiries are off in the Pittsburgh District, but not enough to shake faith in the immediate future.

WHILE DOMESTIC orders have fallen somewhat Cincinnati machine tool builders have taken foreign business to more than fill the gap and shops will be occupied for months to come. Detroit is cheered by prospects for better business following the announcement of new cars at the New York and Chicago shows within the next two or three weeks. St. Louis business is still quiet and there seems to be no immediate expectation of any change.

CHICAGO continues to be the brightest spot in the machinery picture. September was an excellent month, and October opened well for several of the the distributors there. Milwaukee reports declining business but observes that the level is still well above the level of a year ago.

WEST COAST statistical agencies, which are seeking to sound out business opinion on future trends, seem in their reports to agree that business men feel Pacific Coast industry will continue to hold small gains over last year's record for several months to come. There is, however, no indication of immediately forthcoming improvement. Trade continues to fall off slightly, and one Los Angeles bank reports that had not an extraordinary building permit been recorded last month, the business index would have been the lowest for the year. Farm prospects continue excellent, bolstering the prospect of continuing buying power.

CHIPS

Washington

Roosevelt's masterly speech on violation of treaties in the Far East serves admirably to distract attention from the Black case . . . Sec. Hull follows up with statement that U. S. will attend meeting of signers of nine-power treaty to discuss attacks on China . . . Peace-at-any-price advocates disturbed at implied ignoring of Pittman neutrality law . . . President Green at Labor Convention urges boycott of Japanese products . . . Speakers at Civil Engineers' meeting condemn TVA, Grand Coulee, Fort Peck and 'Quoddy dams as uneconomical . . . Supreme Court refuses to accept two motions to unseat Justice Black . . . Bumper wheat and corn crops expected to revive demand for crop control . . . President calls special session of Congress to convene November 15 to pass bills that failed in regular session.

Foreign

Mussolini's answer to Franco-British 24-hour ultimatum is to send 23 more fast bombers to aid Franco, declines to join 3-power parley . . . More news of unrest and massacres in Ethiopia leaks through Italian censorship . . . Italy sends 50,000 troops to Libya whence they can easily be moved against Egypt or French Tunisia or to Spain . . . French reach agreement with Pan-American Airways for interchange of transatlantic facilities . . . Soviets arrange to buy $50,000,000 of naval equipment in U. S. . . . Japanese flyers fire on British motor cars near Shanghai but fail to hit anyone . . . Tokyo restricts imports of luxuries to pay for war materials . . . Nazis guarantee neutrality of Belgium.

Finance

War scares drive stock market lower and deepen the discouragement in New York . . . Treasury officials issue optimistic statement calling attention to reduction in relief payments of over one billion . . . S.E.C. may lower margin requirements . . . U. S. and Canada will exchange income tax information.

Industry

A.F. of L. threatens to demand repeal or amendment of Wagner Act if C.I.O. wins Allis-Chalmers election where lines are clearly drawn between craft and industrial unions . . . Leaders of Professional Engineers demand amendment of Wagner Act to protect them from C.I.O. organizers. . . . C.I.O. leaders gather in Atlantic City to discuss counter measures to meet A.F. of L. attacks planned at Denver . . . Lewis tells his followers it is a matter of indifference to him whether A.F. of L. throws out C.I.O. or not . . . A.F. of L. convention votes expulsion by 20 to 1 . . . Will undertake to organize clerical workers . . . Lewis suggests committee of 100 each from C.I.O. and A.F. of L. to draw up peace terms . . . Green's convention offers counter proposal.

Indicators

Steel production drops several more points as automobile manufacturers limit orders to 30 days . . . Electric power output index down . . . *Business Week's* index off 2 points to 71.9.

A.S.M.E. Inaugurates Plan of Quarterly Meetings With Session at Erie

ERIE—Something over 250 members and guests attended the Erie meeting of the American Society of Mechanical Engineers October 4–6. This meeting was the first general meeting to be held under the new plan to have four general meetings of the society each year instead of the two that have been customary. Thanks to hard work on the part of the Erie members the meeting was rated as successful by officers of the society in attendance. As so often happens in smaller meetings the papers were presented somewhat less formally and discussion was active and informative.

Of particular interest to men in the metal-working industry were companion papers by A. T. Wood, consulting mechanical engineer, and A. G. Cochrane, superintendent of welding and fabrication, General Electric Co., Schenectady. Mr. Wood explained the procedure at Schenectady for adapting large power units to the welding process. Mr. Cochrane discussed practical considerations in the application of welding to such units. It was pointed out that nothing is gained in switching to fabrication of steel by welding if practically as many machining operations have to be performed subsequently as would be required for cast parts. The objective at Schenectady is to design the parts and lay out the operations to the end that there be as few welding or machining operations as possible.

At the same time the technique developed permits of a standard of accuracy on large units that is at least as good as would be expected from machined castings. Complete cooperation between the engineers and men in the shop is essential to this result.

Mechanical Engineers in the Electrical Industry

A whole general session was given over to discussion of the place of the mechanical engineer in the electrical industry. A. R. Stevenson, Jr. and E. E. Parker, both of the General Electric Co., Schenectady, and both actively interested in the advanced training work for young engineers there, presented a paper in which they pointed out that most of the products made by the General Electric Co. involve considerably more mechanical than electrical engineering. Illustrations of many of the company's products were shown to prove their essentially mechanical engineering nature. Discussion centered on the proper methods of training graduate mechanical engineers in industry and on what sort of college or technical school training they should have before entering industry. There was general agreement that more emphasis should be placed on fundamentals in the undergraduate courses.

Electric Gaging

Gaging came in for attention at a session where C. M. Hathaway and E. S. Lee from the General Engineering Laboratory of General Electric at Schenectady described precision measurement made with various types of electric gages. A second paper by F. M. Graham, assistant engineer of standards, Pennsylvania R. R., Altoona, dealt with the application of electric gages to measurement of strains in bridge and track work on railroads. Mr. Graham said that as a result of such measurements it was found unnecessary to replace several hundred thousand dollars worth of bridges which had been thought too light to carry the new heavy electric tractors now operating on the route between New York and Washington.

Milling Research

At the Cutting of Metals session two more papers in the comprehensive series developed by the Special Committee on Cutting of Metals headed by Coleman Sellers, III, of Philadelphia were offered. The first, by C. E. Kraus and R. R. Weddell, Ingersoll Milling Machine Co., Rockford, described tests on 23 different high speed steels using as a test block a vertical cylinder divided into six segments to get from the single point cutting tool an action somewhat analogous to that of a face milling cutter. Mr. Kraus who presented the paper gave the mathematics for transforming results from this test to the usual formula for such tests, $VT^N = C$. Comments from representatives of the tool steel companies in the audience indicated that their own findings were in general agreement with those of the authors.

Prof. O. W. Boston and Instructor W. W. Gilbert of the University of Michigan, and K. B. Kaiser, Ingersoll Milling Machine Co., reported the results of dynamometer tests of helical mills cutting SAE 3150 steel in a knee-type milling machine. A new type of dynamometer was developed for this test which operated under actual shop conditions. It was arranged so that the three components of the cutting force were measured on separate dials. Valuable information on the horsepower required under various cutting conditions was developed.

Local Plants Visited

Trips to such local industries as the General Electric Co., the Erie Forge & Steel Co., the American Sterilizer Co., and the Erie City Iron Works rounded out the meeting for those interested in machine shop methods. President James H. Herron presided at the dinner where A. R. Smith, managing engineer of the Turbine Dept., General Electric Co., Schenectady, spoke on "Wealth and Engineering," and W. LeR. Emmet traced the developments of electric propulsion for ships and of the mercury vapor turbine with which he has been identified for many years.

A.S.M.E. Elects Officers

PRESIDENT

H. N. Davis
President, Stevens Inst. of Technology

VICE-PRESIDENTS

(To serve 1 year)

F. O. Hoagland
Master Mechanic, Pratt & Whitney Division, Niles Bement-Pond Co.

(To serve 2 years)

B. M. Brigman
Dean, Speed Scientific School, University of Louisville

Harte Cooke,
Mechanical Engineer, McIntosh & Seymour Corp.,

W. H. McBryde,
Construction Engineer, San Francisco, Calif.

L. W. Wallace,
Director, Equipment Research, Association of Am. Railroads

MANAGERS

(To serve 3 years)

Carl Bausch,
Vice-President, Bausch & Lomb Optical Co.

S. B. Earle,
Dean, School of Engineering, Clemson A. & M. College,

F. H. Prouty,
Partner, Prouty Brothers Engrg. Co.

DETROIT LETTER

Auto industry speeds up, will build more than a million cars this quarter . . . Ford increasing steel capacity . . . New engines planned for 1939 . . . G. M. tooling up for diesels . . . Nash to build air-conditioned cars

DETROIT—Car manufacturers finally have snapped out of a lethargy which threatened to cut down fourth quarter operations. They are back near a 100,000-a-week level and shortly should be above it. Individual companies are talking in terms of high production rates the remainder of the year so that total output for the industry this quarter should be at least as good as in the same quarter a year ago. From Oct. 1 to Dec. 31 of last year 1,154,806 units were built.

The industry doesn't expect, however, to keep up its fast pace into next year. Introduction of new models always stimulates retail car buying; hence companies should enjoy a big fourth quarter. General opinion is that they will begin to feel a pinch during January and February. Car makers point out that when the volume gets as high as 5,000,000 cars in a single year, as it has in 1937, sales are being borrowed from the years immediately ahead.

Ford Spending

Though there may be an urge for economy, some big capital outlays are in prospect. Ford is in the midst of a $40,000,000 program of expansion at the Rouge plant. Erection of an alloy steel foundry is a part of that program. Ford's use of a special alloy steel for casting of automotive parts, such as crankshafts, has grown amazingly the past few years and greater productive capacity is needed. As first reported in this column last June, Ford also is engaged in construction of new steel-making capacity, which includes a new all-welded blast furnace, enlargement of present open-hearths, and new equipment in the hot sheet mill to permit sheets 60 inches in width to be rolled. Even when the program is completed, thus bringing raw-steel capacity up nearer to finished-steel capacity, Ford will be able to produce only about half its own steel requirements.

Not mentioned in Ford's announcement of its expansion program but probably a part of it is the plan for greatly augmented facilities for body making. This is only in the preliminary stages and the equipment now decided upon probably won't be ready before the 1939 season. Apparently while Ford continues its decentralization by establishing more village industries in southern Michigan, it also is concentrating still more work at Rouge.

Keeping One Jump Ahead

On the eve of the 1938 automobile show season the industry is figuring on what it should do in 1939. Many changes are promised. For one thing, there will be some brand-new motors. Both Plymouth and Dodge are reported to be developing new engines to be ready a year from now. It wouldn't be surprising to see some important engine changes at Dearborn, though there would be no intention of getting away from the basic design of the present V-eight motor.

There is no indication of a flop in 1939 to rear-engined cars. However, one of the leading companies is reported working on a plan which would permit the engine to be moved from the front to the rear and the transmission and drive to be in front. This design would not necessitate the complete redesign of present-day motors and could be used with a minimum of disruption of present manufacturing practices.

Plans of General Motors in the diesel field are widening. The Diesel Engine Division, which is now erecting a plant in northwest Detroit, is counting on making a big dent in the industrial field with a single cylinder diesel. It intends to tool up for an output of 200 units a day and it hopes to create a market which will absorb more than 50,000 one-cylinder diesels a year. Diesels for automotive use, which will be made at the Detroit plant, will be merchandised through General Motors Truck Division.

Diesels are making considerable headway in the truck field, particularly for heavy, long-distance hauling on the Pacific Coast. Diamond T was the first company to put diesel-powered trucks into quantity production. In August Studebaker announced a diesel truck. Many companies, such as Autocar, have been supplying diesel powerplants for their trucks when buyers have requested them. Chrysler's diesel engine for trucks, which has been tested exhaustively on the road the past two years, is said to be very close to actual manufacture and sale.

The equipment trade is looking for early buying of machinery for 1939. Several car makers got caught this fall by delays in machine deliveries because they waited to long to place orders last spring. A large machine tool business looms. In the quest for ways and means of lowering production costs, some companies are likely to redesign engines so that they can be built for less labor expense than at present.

There are some changes in the motor car lineup for 1938. The names of Auburn and Cord will be missing, though the latter set the style widely imitated in '38 models. The Airflow, which established new standards in car design and which was the first of the so-called streamliners, has been dropped from the Chrysler line, though its principles are incorporated in all Chrysler-made cars.

Small but Powerful

The new Cadillac V-16 motor is attracting attention. It is so compactly built that it occupies less space than the average straight eight and weighs 250 lb. less than the previous engine. Cylinder barrels are mounted at a 135-deg. angle, making the power unit almost flat. The wide V offers a roomy and natural cradle for engine accessories. The bore and stroke have the same measurements, 3½ in. The stroke is the shortest on any automobile. The redesigned engine makes it possible to reduce the car's wheelbase by 13 in. to a length of 141 in.

Nash, with an ambitious program for 145,000 cars the coming year, is introducing a conditioned-air unit for heating its cars which promises to revolutionize methods of heating automobiles. It is claimed that the air inside the car can be kept at a constant temperature even though the weather may be below zero.

American Bantam is back in the running. Cadillac has abandoned its V-12 and has put its revamped V-16 in a prominent position.

Foreign Buying Sends Machine Tool Index Up

Although domestic sales dropped another ten points, foreign orders reversed the downward trend of the National Machine Tool Builder's Index with a big jump of 40.4 points. Foreign sales in September were the highest recorded since the index began recording them and represented 42 per cent of all the business done. The month's gain over August of 30.9 points was sufficient to cause the three month's average trend to turn upward again.

Index of Machine Tool Orders

Month	Based on Volume of Shipments for 1926 Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1936 — October	105.4	31.1	136.5	127.5	23
November	110.7	36.4	147.1	134.0	25
December	205.7	52.0	257.7	180.4	20
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	18
April	232.5	50.0	282.5	219.8	18
May	161.4	47.1	208.5	234.2	22
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	32
August	129.5	50.3	179.8	180.9	28
September	119.0	91.7	210.7	187.2	42

Distribution of Orders

Average Indexes of Individual Companies Based on 1926 Level of Business	Companies In Per Cent of Total Number Reporting: 1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 2nd Quar.	1937 3rd Quar.
200–up	17.2	15.8	28.4	38.5	33.4
100–199	32.6	28.8	30.2	29.1	30.2
60– 99	19.0	22.9	19.5	15.1	15.7
20– 59	21.8	21.7	15.2	11.4	12.7
Less than 20%	9.7	10.8	6.7	5.9	8.0

Machine Tool Dealers Elect A. C. Bryant, President

The Annual Meeting of the Associated Machine Tool Dealers which was held at French Lick Springs Hotel, French Lick, Ind., Oct. 11-12 was one of the most interesting and well attended meeting this group has held. Officers elected at the concluding session were: A. G. Bryant, Machinery & Engineering Co., president; John Sauer, Jr., Peninsular Machinery Co., vice-president; E. P. Essley, The E. L. Essley Machinery Co., secretary-treasurer.

H. E. Oatis, The National Supply Co., F. W. Schiefer, F. W. Schiefer Machinery Co., and F. Rodger Lindsay, Swind Machinery Co., were selected as members of the executive committee for the terms expiring in 1940. Harry Barney, Barney Machinery Co., as past president will also serve on the executive committee.

At the Monday morning session, Harry S. Robinson, secretary and sales manager, Cincinnati Shaper Co., talked on "Sales Promotion." He emphasized the importance of adequate statistics in the sale of machine tools, the manner in which advertising can increase sales, and other points. Following Mr. Robinson, F. B. Scott, Jr., Syracuse Supply Co., spoke on the "Training of Salesmen." A great deal of interest was shown in Mr. Scott's outline of the methods used by his company in acquainting their salesmen with the products they sell. He also explained the manner in which salesmen must report on calls and indicate the machines which are involved. He stated that this information is tabulated and used in connection with contacting builders.

The dinner meeting which was held on Monday evening featured talks by Homer Bayliss, Motch & Merryweather Machinery Co., and Charles A. Odegaard, Federal Machinery Sales Company. Their remarks related to meetings held in Detroit and Chicago. These meetings were attended by direct sellers, as well as dealers, and were unusually successful.

Other speakers at the dinner meeting were Tell Berna, general manager, National Machine Tool Builders' Association; Henry C. Pierle, secretary and sales manager, R. K. LeBlond Machine Tool Co.; and J. C. Carlton, president, Carlton Machine Tool Co.

Exports of Machinery During August, 1937

	August 1937	July 1937	August 1936
Electrical machinery and apparatus	$8,981,110	$10,275,037	$7,207,420
Power generating machinery (except automotive and electric)	1,412,965	1,381,981	639,578
Construction and conveying machinery	2,312,936	2,175,727	1,024,222
Mining, well and pumping machinery	5,708,431	5,764,288	2,477,771
Power driven, metal-working machinery	4,190,386	4,665,741	2,234,789
Other metal-working machinery	384,366	439,351	205,425
Textile machinery	1,034,596	1,073,709	884,212

Exports of Metal-Working Machinery During August, 1937

	August 1937	July 1937	August 1936
Engine lathes	$260,619	$388,936	$145,790
Turret lathes	222,946	346,201	215,054
Other lathes	99,875	98,490	61,274
Vertical boring machines and chucking machines	147,721	238,970	63,836
Thread cutting and automatic screw machines	232,598	327,683	159,570
Knee and column type milling machines	223,766	199,164	72,882
Other milling machines	278,203	227,157	210,254
Gear cutting machines	142,769	84,474	77,510
Vertical drilling machines	41,599	95,218	6,119
Radial drilling machines	37,874	55,869	7,752
Other drilling machines	61,119	63,078	55,541
Planers and shapers	45,112	56,412	40,405
Surface grinding machines	84,979	128,391	112,050
External cylindrical grinding machines	103,325	39,848	32,895
Internal grinding machines	170,487	223,720	69,183
Tool grinding, cutter grinding and universal grinding machines	154,398	124,311	59,161
Other metal grinding machines	174,398	170,305	55,566
Sheet and plate metal grinding machines	310,954	284,626	116,329
Forging machinery	162,455	143,040	68,758
Rolling mill machinery	442,430	578,824	185,828
Foundry and moulding equipment	179,566	95,933	57,276
Other power-driven metal-working machinery and parts	613,193	694,091	361,756

Other Metal-Working Machinery

Pneumatic portable tools	$127,624	$113,938	$55,198
Portable and hand and foot operated metal-working machines and parts	142,787	127,481	76,448
Chucks for machine tools	18,277	25,210	12,129
Milling cutters, machine operated threading dies and taps and similar machine-operated metal cutting tools	49,852	87,497	29,390
Other metal-working machine tools	45,826	85,225	32,260

WATCHING WASHINGTON

Congress to convene in special session . . . Anti-trust law to be strengthened . . . Identic bids under fire . . . Battle looms on wage-hour bill . . . Neutrality stand altered by Chicago speech

WASHINGTON—President Roosevelt's Columbus Day gift to the nation was an announcement that it would discover Congress back in Washington on November 1. Security values, already scraping bottom, greeted the news with new lows on the following day.

The announcement was made at a press conference and was followed a few hours later with one of the Executive's famous fireside chats. In telling what he expected Congress to do, he stressed his recent trip, indicating that the demand for prompt legislation was a result of keeping his finger on the nation's pulse.

Subjects to receive primary attention on Capitol Hill were listed as farm production control, wage and hour standards, regional planning and reorganization of the executive branch of the government. The broadcast did little to alleviate the bad case of jitters that business had acquired as a result of legislative prospects. Speaking of crop curtailment the President compared it to shutting down an industrial plant when orders fell off, saying "When it is their baby who has the measles, they call it not 'an economy of scarcity' but 'sound business judgment.'" He also paid his respects to business monopolies stating that studies are being made to strengthen anti-trust laws in order to end them.

Practices Judged on Results

This revision of the anti-trust laws will aim at results rather than methods. Details have not been worked out, but the idea is that if certain practices, whether in conformity with the old construction of conspiracy in restraint of trade or not, which produce identic prices or eliminate weak competitors or concentrate control of the market in any given line in a few hands shall constitute a violation of the law. The point is to be that the practices shall be judged not on their own merits or lack of morals but on the results which flow from them.

The best interpretation of the administration's attitude is revealed in the prosecution now going on against oil companies, oil executives and publications which printed news about their price intentions at Madison, Wis. It is contended by the government that mere publication in certain journals of price changes serve actually as notice to all in the oil business to make their prices just that.

Identic bids on government supplies are what really is burning the government up. This is the result the administration wants to make illegal without compelling the government in prosecuting an anti-trust law to prove that in achieving that result some practice at variance with the anti-trust law was employed.

The call of Congress is not without political implications. It will give senators and representatives a chance to avoid another long summer session and to return to their constituencies in time to repair political fences. It will enable enactment of a farm bill in time to set up machinery to be effective in the next crop year. It is thought, too, in administration circles that if the wages and hours bill can be made effective by spring, it will be impossible for its opponents, and especially the conservative Democratic rebels, to make it a fall issue.

YARDSTICK FALLS SHORT

Under the Vinson-Trammel act the government undertook to manufacture airplane engines as a yardstick. Were the yardstick applied the government would pay twice as much for its engines, so nothing is being said about costs. Private manufacturers with plenty of orders on their books are perfectly willing to collect the royalties the government has to pay them for the use of their patents. Despite the failure to manufacture economically, Senator Bone, of Washington, is preparing to urge that the government be required to produce 50 per cent of its engines in the future.

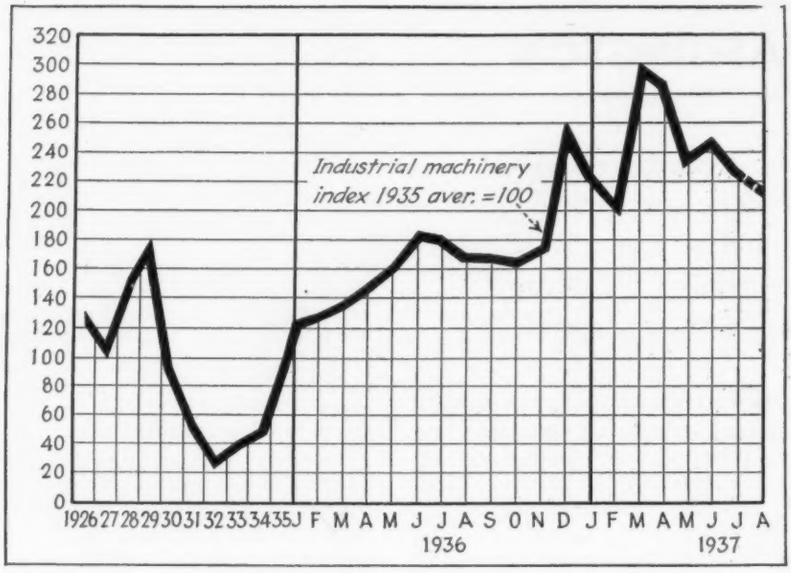
All of the foes of the wage-hour bill are quietly getting ready for battle. Southern lumber, foremost among those who stopped the bill in the House Rules Committee, is still in a fighting mood. They are not inclined to consider any compromise, such as an exemption or a differential in favor of their businesses. They are out to beat the legislation. In his executive council report to the A. F. of L. convention, William Green took the same stand he maintained last summer—that the bill is all right provided it carries his amendment, the effect of which is to keep government out of the high wage collective bargaining field. The A.F. of L. plutocrats of labor, really have no interest in this legislation except for trading purposes. Wages of all their crafts are above the minimums proposed.

John L. Lewis, of C.I.O., will not venture to take so strong a stand as Green so long as high wage bargaining is kept out of the picture. He has the President's favor again, also the support of the Labor Relations Board. On the other hand, any wage-hour law would encroach more on Lewis than on Green, C.I.O. being composed mostly of common low-wage workers who, if the can get their benefits from the government, would gain nothing from C.I.O.

Lawrence Connery has been elected representative from Massachusetts and says he will do everything in his power to revise the Black-Connery bill. That is the draft that was slapped down by both Mr. Green and Mr. Lewis, so it cannot have much of a chance.

Aggressor Nations Denounced

Little light was thrown on the administration's foreign policy by the President's fireside broadcast. His Chicago speech, calling for a "quarantine" of aggressors aroused considerable speculation since it pointed to a marked departure from the neutrality policy previously followed. The State Department's statement condemning Japan's action in China clearly indicated abandonment of the previously accepted principle of treating aggressors and invaded nations alike. This country now seems to be committed to some sort of cooperative action against nations actively engaged in extending their boundaries. A specific step was Secretary Hull's agreement to participate in the proposed international conference of the signatories of the nine-power treaty to consider the Far East situation in order to bring about peace or to curb Japanese aggression.



Industrial Machinery Index Continues Downward

Since March the American Machinist Index of Industrial Machinery Orders has declined steadily, with the single exception of June when it kicked upward ten points. The final August figure is 215, which is 13 points below the July figure. This drop, however, is at a smaller rate than the drop from June to July. The August level is 44 points above the level of August 1936.

C. W. Spicer Nominated for S.A.E. Presidency

C. W. Spicer, vice-president, Spicer Mfg. Corp., has been nominated for president of the Society of Automotive Engineers for 1938. Election will be held at the annual meeting in Detroit, January 10-14, 1938. Nominations for all other offices have been made.

In addition to the officers to be elected, Ralph R. Teetor, charge of engineering, Perfect Circle Co., and Harry T. Woolson, executive engineer, Chrysler Corp., will serve on the 1938 council as past-presidents. Members of the council will also include three men who were elected in 1937 for a two year term. They are: A. T. Colwell, vice-president, engineering, Thompson Products, Inc., W. C. Keys, mechanical products enneering, Thompson Products, Inc., J. L. Stewart, gen. mgr., Canadian Automobile Chamber of Commerce.

PRESIDENT
C. W. Spicer

VICE-PRESIDENTS

Aircraft
Frank W. Caldwell
Engineering Manager, Hamilton Standard Propellers

Aircraft-Engine
Ralph N. duBois
Experimental Engineer, Aviation Mfg. Corp., Lycoming Div.

Diesel-Engine
Carl Behn
Superior Engine Division, National Supply Co.

Fuels and Lubricants
B. E. Sibley
Chief Technologist, Continental Oil Co.

Passenger-Car
Clyde R. Paton
Chief Engineer, Packard Motor Car Co.

Passenger-Car-Body
Frank S. Spring
Engineer, Hudson Motor Car Co.

Production
E. N. Sawyer
Product Engineer, Cleveland Tractor Co.

Tractor & Industrial Power Equipment
C. E. Frudden
Chief Engineer, Allis-Chalmers Mfg. Co.

Transportation & Maintenance
F. L. Faulkner
Automotive Engineer, Manager, Automotive Dept., Armour & Co.

Truck, Bus & Railcar
H. E. Simi
Chief Engineer, Twin Coach Co.

TREASURER
David Beecroft
Bendix Products Corp.

COUNCILORS
Term of 1938-1939

W. J. Davidsons
General Sales Manager, Winton Engine Corp.

L. J. Grunder
Automotive Engineer, Richfield Oil Co.

B. J. Lemon
Tire Engineer, U. S. Rubber Products

William J. Kelly Elected President of M.A.P.I.

William J. Kelly, president, Arthur J. O'Leary & Son Co., manufacturers of iron and steel products, Chicago, has been elected president of the Machinery and Allied Products Institute. He succeeds John W. O'Leary, chairman of the executive committee, Chamber of Commerce of the United States. Mr. O'Leary will remain a member and chairman of the executive committee of the Institute.

A statement issued by the executive committee to members of the Institute said, "Mr. Kelly, who has an outstanding record as an executive in the machinery industry and wide experience in civic and business organizations, is one of the few men in the country sufficiently informed on the economic and management problems of the durable goods industry to head an organization of American machinery manufacturers." In addition to his industrial background, Mr. Kelly has had wide experience in banking and commercial organization.

Officers of the institute are: Robert M. Gaylord, vice-president; Paul C. DeWolf, treasurer; Alexander Konkle, secretary. Members of the executive committee are: Harry C. Beaver, William C. Dickerman, Charles E. Brinkley, George H. Houston, Maurice F. Dunne, John W. O'Leary, Robert E. Friend, L. W. Grothaus, Phillips Dennett, Frederick V. Geier, Robert W. Gillispie, W. B. McSkimmon, Philip M. Morgan, W. S. Shipley and Guy A. Wainwright.

Gas Association Elects F. H. Adams Director

Among those elected to directorships at the 19th Annual Convention of the American Gas Association which was held in Cleveland, September 27-October 1, were F. H. Adams, vice-president, Surface Combustion Corp., and J. S. DeHart, Jr., president, Isbell-Porter Co., Newark, N. J.

WILLIAM C. CARTER

EDWARD J. BURNELL

Link-Belt Company Elects Two New Vice-Presidents

William C. Carter and Edward J. Burnell have been elected vice-presidents of the Link-Belt Co., Chicago. Mr. Carter is a mechanical engineering graduate of the University of Illinois, and has been with the Link-Belt organization since 1902. In recent years he has been in charge of company production with headquarters in Chicago.

Mr. Burnell is a mechanical engineer from Lehigh University and joined the Link-Belt organization in 1913. After service in various sales departments he became general manager of the Chicago plant.

Allied Railway Group Elects 1938 Officers

The Allied Railway Supply Association, Inc., which handled the equipment exhibit prepared for the joint meeting of four railway societies, Chicago, from September 28 to October 1, elected the following officers for 1938: L B. Rhodes, Vapor Car Heating Co., Washington, D. C., president; J. W. Fogg, MacLean,Fogg Nut Co., Chicago, first vice-president; C. S. Weil, American Brake Shoe & Foundry Co., Chicago, second vice-president; F. W. Benton, Crane Co., Chicago, third vice-president; M. K. Tate, Lima Locomotive Works, Inc., Lima, Ohio, fourth vice-president; H. S. Mann, Standard Stoker Co., Inc., Chicago, fifth vice-president; J. E. Gettrust, Ashton Valve Co., Chicago, and G. R. Boyce, A. M. Castle & Co., Chicago, were re-elected secretary and treasurer respectively.

PERSONALS

HERMAN L. TYGESSON has been made general superintendent, Kron Co., maker of industrial dial scales, Bridgeport, Conn.

JOHN HOWE HALL has resigned as technical assistant to the president, Taylor-Wharton Iron & Steel Co., to become a consulting engineer in foundry work, also in manufacture and applications of steels and iron to wear and corrosion resistance.

J. E. HAINES, formerly assistant manager, Minneapolis-Honeywell Modutrol Division, is now assistant manager in charge of the National Regulator Co., division of Minneapolis-Honeywell.

H. B. KAHLE, who has been head of the Arnold, Pa., Extrusion Department of the Aluminum Company of America for the past three years, has been promoted to the position of superintendent of the new extrusion works now being built at Lafayette, Indiana.

BONNELL W. CLARK, vice-president and general manager, Westinghouse Electric Supply Co., recently was elected president of the company. He has been with this company since 1925. He served as chairman of the National Electrical Wholesalers Association from 1930 to 1932.

BUSINESS ITEMS

Hammond Machinery Builders, Inc., Kalamazoo, Mich., announced that F. O. SCHRAMM, 11 West 42nd St., New York, has been made a representative of the Grinder Division.

Rochester Metal Products, Inc., Elizabeth and Fourth Sts., Rochester, Ind., has been formed to manufacture tools, forgings, castings and metal products. Incorporators are ROSCOE D. PONTIUS, CHARLES E. PYLE and CHARLES C. CAMPBELL.

The Lincoln Electric Co., Cleveland, Ohio, has appointed F. M. MAICHLE as manager of its Detroit Arc Welding Sales-Engineering office.

Muncie Belting & Mill Supply, Inc., 615 South Elm St., Muncie, Ind., has been incorporated to manufacture tools, machinery, novelties and to deal in belting. The incorporators are CLIFFORD PEACOCK, M. W. SYMONS and W. D. WHITE.

Westinghouse Electric Elevator Co., announces that with its acquisition of the A. B. See Elevator Co., Inc., it has made plans for increasing the manufacturing space of that company's plant by approximately 50 per cent. The company's headquarters are also to be moved from Chicago to Jersey City. However, operations will be continued in the Chicago plant.

American Cutting Alloys, Inc., announced that DR. PAUL SCHWARZKOPF is expected to arrive in this country soon and that he is bringing with him an electric furnace element capable of operating at 3,000 F. which is to be exhibited under operating conditions at Pittsburgh, beginning the first week in November.

Moraine Products Division, General Motors Corp., Dayton, Ohio, announces that it has moved into its new office and plant at Wisconsin Boulevard.

The Warner & Swasey Co., Cleveland, was given the National Industrial Advertising Association award for its direct-mail, trade paper and general magazine advertising for the past year.

Electro Metallurgical Co., unit of Union Carbide & Carbon Corp., is planning a new plant in the Wilson Dam, Alabama, area principally for the manufacture of ferro-alloys, calcium carbide and other electric-furnace products.

Bethlehem Steel Co., Bethlehem, Pa., on October 10 released its motion picture "Building the Golden Gate Bridge."

American Grinder & Specialty Corp. has moved from Milwaukee to Fond du Lac, Wis., according to E. BOCKSHE, president and general manager.

Borg-Warner Corporation has begun the construction of a $500,000 building for the mechanics universal joint division.

Lobil Aircraft Corporation has been organized for the manufacture of military planes by J. LOBIL, president, CHARLES T. LEIGH, E. J. RIVERS, GREGORY M. CREUTZ and E. J. DICKINSON.

Lewis-Shepard Co., manufacturers of materials handling equipment, Boston, Mass., has appointed GEORGE H. CORLISS, regional manager for the company with headquarters in Los Angeles at 1401 Santa Fe Ave.

Johnson Bronze Co., New Castle, Pa., has appointed Connell-Roper, Inc., 2816 Commerce St., Dallas, Texas, as sales representatives.

OBITUARIES

Ernest J. Lees, Pioneer in Gear Work, Dies

Ernest J. Lees, vice-president and chief engineer, National Tool Co., Cleveland, and well known in the machine tool industry for his development of gear-cutting machinery, died September 27. Mr. Lees was one of the founders of the Lees-Bradner Co., Cleveland, maker of gear-cutting machinery. Five years ago he disposed of his interests in that company and became affiliated with the National Tool Company as chief engineer. When the company was recently reorganized he was made vice-president.

Mr. Lees became connected with the machine tool industry when he and John J. Grant organized the Grant-Lees Co. from which he went to form the Lees-Bradner Co. He was one of the pioneers in this country in gear hobbing machines and is credited with designing helical and worm gear drives for heavy milling machines. In addition to many other devices he designed and built the first spur and helical gear generating hobbing machine sold in this country, the first helical gears cut by the hobbing process and used as timing gears, the first ground generating hobs made in this country and known as hyperboloid hobs. He developed the first formula for generating helical gears on a hobbing machine without using a differential, designed and built the first commercial gear generating grinders marketed in this country. He also designed and built gear testing machines, six-spindle full automatic machines for making twist drills from the bar, a positive opening chuck, the convolution hob. He is also credited with the original positive automatic micrometer stock for gear generating machines.

C. E. Hildreth Dies; Was Machine Tool Manufacturer

Charles E. Hildreth, retired manufacturer of machine tools, died October 6 at the age of 70.

After graduation from Amherst College in 1892 he entered the machinery manufacturing business and was a partner in P. Blaisdell & Co., from 1892 to 1895. He was vice-president and treasurer of the Whitcomb-Blaisdell Machine Tool Co. from 1895 to 1915, at which time he was made president and general manager. He was also general manager of the National Machine Tool Builders Association. He served at one time as counselor of the National Metal Trades Association.

Clarence R. Falk Was Official of Falk Corporation

Clarence R. Falk, secretary-treasurer of the Falk Corp., Milwaukee, died September 29 at the age of 67.

Mr. Falk became associated with the corporation in 1901 and was made vice-president and works manager in 1914. After service in the World War he returned to the corporation and in 1923 assumed the position of secretary-treasurer. He was a past-president of the National Metal Trades Association and remained a director until his death. He was also a member of the industrial relations committee of the American Foundrymen's Association.

FRED W. PRIEP, president, Laclede Stoker Co., St. Louis, died recently at the age of 68.

THOMAS ALLSOP, president, Philadelphia Drying Machinery Co., Philadelphia, died September 24, at the age of 71.

NORMAN MCCARTY, a mechanical engineer who pioneered in the field of Diesel motors, died recently at the age of 78.

ANNA M. KELLY, secretary and assistant treasurer, G. M. Basford Co., New York, died October 6. Miss Kelly had been secretary and assistant treasurer of the company from the time it was organized in 1916. Prior to that time she was with the American Locomotive Co. and Joseph T. Ryerson & Sons. At the time of her death, Miss Kelly was also secretary and treasurer of the Locomotive Feed Water Heater Co.

MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting. New York, N. Y. December 6-10. Secretary, 29 W. 39th St., New York.

INTERNATIONAL ACETYLENE ASSOCIATION. 38th annual convention. Birmingham, Alabama. November 10-12.

NATIONAL AUTOMOBILE SHOW. New York. Oct. 27-November 3.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION. Annual meeting, Chicago. Oct. 24–29. W. J. DONALD, managing director, 155 E. 44th St., New York.

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION. Annual Convention. Hot Springs, Va., Oct. 25-27.

SOCIETY OF AUTOMOTIVE ENGINEERS. National Production Meeting. Hotel Durand, Flint, Mich. Dec. 8-10.

PATENTS

September 28, 1937

Metal-Working Machinery

Die-Casting Machines. William A. Parker, Erie, Pa. Patents 2,094,079; 2,094,080.

Furnace for Brazing. Elmer B. Welch, McKeesport, Pa., assigned to Firth-Sterling Steel Co., McKeesport, Pa. Patent 2,094,249.

Milling Machine. Arthur F. Bennett, West Barrington, R. I., assigned to Brown & Sharpe Mfg. Co., Rhode Island, Patent 2,094,484.

Parts and Mechanisms

Arc Welding Apparatus. Albert M. Ross, New Britain, Conn. Patent 2,094,411.

Two-Feed Control Mechanism for Hydraulically Operated Machine Tools. Raymond A. Carlson, Rockford, Ill., assigned to Borg-Warner Corp., Chicago. Patent 2,094,526.

Processes

Method of and Apparatus for Manufacturing Rolled Steel Worms. Haskell C. Carter and Albert L. Wallace, Portland, Ore., assigned to Iron Fireman Mfg. Co., Portland. Patent 2,094,204.

Tools and Accessories

Electrode Holder. Sidney M. Harvey, Detroit, Mich. Patent 2,094,121.

Vise. Nathan W. Warman, Los Angeles, Calif. Patent 2,094,198.

Automatic Blast Torch. Samuel C. Brody. Brighton, Mass. Patent 2,094,259.

Die Set. Emil A. Baumbach, Chicago, Ill. Patent 2,094,341.

October 5, 1937

Metal-Working Machinery

Belt Loading Machine (Link). Arthur W. Rodler, Davenport, Iowa. Patent 2,094,620.

Automatic Single Spindle Turret Lathe. Fritz Poppensieker, Cologne, Germany. Patent 2,094,816.

Automatic Turret Lathe. Fritz Poppensieker, Cologne, Germany. Patent 2,094,817.

Nibbling Machine. Karl Gustaf Östberg, Stockholm, Sweden, assigned to Fabriksaktiebolaget Haldatazametern, Holmstad, Sweden. Patent 2,094,928.

Lathe. John E. Lovely and Frank E. Cheever, Springfield, Vt., assigned to Jones & Lamson Machine Co., Springfield. Patent, 2,094,993.

Grinding and Polishing Machine. George D. Moomaw, Syracuse, N. Y., assigned to Crucible Steel Co. of America, New York. Patent 2,095,202.

Parts and Mechanisms

Transverse Carriage Knock-Off Mechanism. John E. Lovely, Springeld, Vt., assigned to Jones & Lamson Machine Co., Springfield. Patent 2,094,994.

Feed Mechanism Control. John E. Lovely, Springfield, Vt., assigned to Jones & Lamson Machine Co., Springfield. Patent 2,094,995.

Motor Driven Headstock for Machine Tools. Albert W. Wigglesworth, Chicago, assigned to Hill-Clarke Machinery Co., Chicago. Patent 2,095,089.

Manufacture of Metal Coated Products. Nelson E. Cook, Edward J. Knopf, Morristown, Ohio, and William L. Diehl, Wheeling, W. Va., assigned to Wheeling Steel Corp. Patent 2,094,583.

Process for Cutting Metals With Oxygen. George M. Deming, East Orange, N. J., assigned to Air Reduction Co., Inc., New York. Patent 2,094,641.

Tools and Accessories

Limited Strain Wrench. Ormond L. Cox, United States Navy. Patent 2,094,584.

Soldering Tool. Kent Johnson, Kansas City, Kan. Patent 2,094,795.

Drafting Instrument. Jeremiah W. Albin, Babylon, N. Y., assigned to William M. Muncy, Providence, R. I. Patent 2,095,116.

SHOP EQUIPMENT NEWS

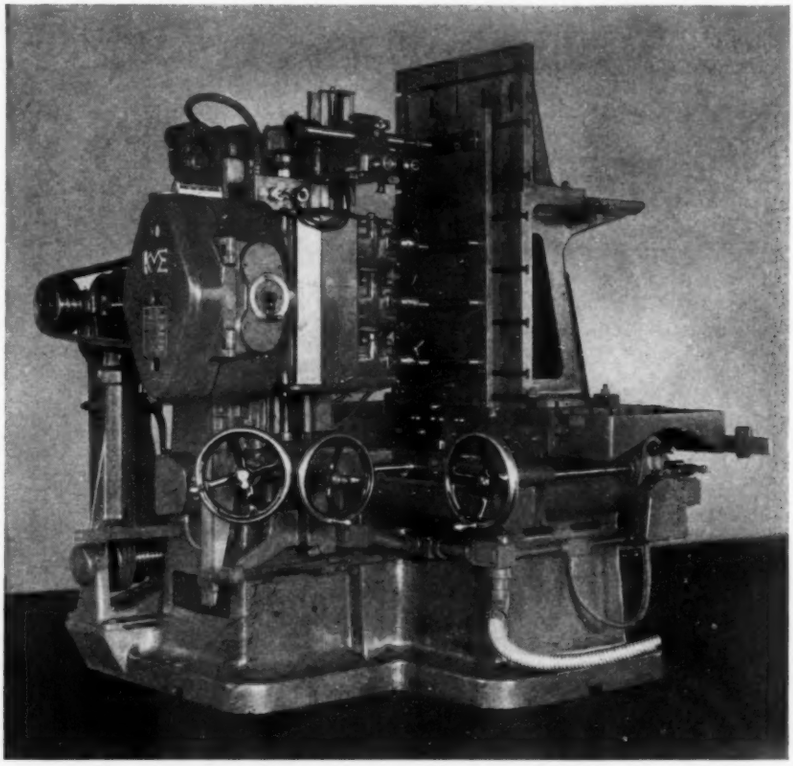


Fig. 1—Geared-head Keller Type BL-2416 die sinker with three cutter spindles—can be used for jobs requiring a single spindle by disengaging top and bottom spindles

P. & W. Keller Type BL-2416 Three-Spindle Tool Room Machine

Retaining the flexibility of the standard Type BL tool room machine, the Keller Type BL-2416 three-spindle die sinker offered by Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn., makes possible the machining of multiple jobs simultaneously from a single master. This machine has a range of sufficient capacity to handle most of the work of the average tool, die or pattern shop. The principle of an adjustable tracer position has been maintained, facilitating the set-up of the master in relation to the work pieces.

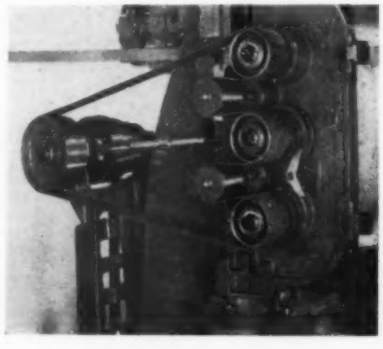
Both a geared-head model, Fig. 1, and a model operated by belt drive from the jackshaft pulley to the three spindle-driving pulleys are available. Cutter drive for the geared-head machine is by multiple V-belts from a 5-hp., constant-speed motor. A multiple V-belt drive connects the jackshaft pulley and a single pulley on the center spindle in the cutter head. Upper and lower spindles are geared to the center spindle.

Back-gearing provides speeds from 140 to 308 r.p.m. With the back-gears disengaged, the three spindles may be operated on open-belt at speeds of 455 to 1,000 r.p.m. Center spindle is always engaged, but the upper and lower spindles may be disengaged by means of shift levers. An additional pair of interchangeable pulleys makes it possible to obtain three additional speeds, ranging from 1,482 to 3,250 r.p.m., on the center spindle. This arrangement permits a maximum range of 140 to 3,250 r.p.m. A second pulley drive arrangement for the geared-head model gives an over-all speed range of 95 to 2,195 r.p.m. The gear-driven, three-spindle machine is recommended for jobs having a substantial amount of stock to be removed, or requiring the use of $\frac{3}{4}$- to 1-in. diameter end mills.

Details of the pulley arrangement for the belt-driven head are shown in Fig. 2. A turnbuckle maintains proper belt tension and the small spindle pulleys are removable for easy cutter change. This model can be belted up for single-spindle operation with a range of speed from 80 to 3,600 r.p.m. The lowest speeds in this series are obtained by back-gearing as shown in Fig. 3. Since the back-gearing cannot be employed when all three spindles are being used, the available range of spindle speeds is from 320 to 3,600 r.p.m. with a three-spindle set-up. Consequently, this model is best adapted to three-spindle operations on work requiring light cuts.

Specifications, apply to both models unless otherwise noted: table work-

Fig. 2—Pulley arrangement for driving all three spindles of belt-driven model. Turnbuckle maintains bolt tension



ing surface, 42x22 in.; table travel, horizontal, 24 in.; table travel, vertical, 16 in.; table travel, transverse, 8 in.; transverse spindle adjustment, 4 in.; center to center distance of spindles, 8 in.; distance from center of top spindle to center of tracer, 10½–18½ in.; distance from center of tracer to center of spindle for single spindle operation, 26½–34½ in. for belt driven model and 18½–26½ in. for geared-head model; minimum distance from working surface of table to center of lowest spindle, 1½ in.

Rate of horizontal travel, 0.8 to 8 in. per min.; vertical travel, 0.8 to 8 in. per min.; transverse travel, 1.2 to 12 in. per min.; range of horizontal and vertical feeds, 0.006 to 0.256 in. per stroke; cutter drive motor, constant speed, 3 hp. for belt driven model and 5 hp. for geared-head model; horizontal, vertical and transverse drive motors, each ¼ hp. adjustable speed; pump drive motor, constant speed, ¼ hp.

Size of machine base, 59⅛ by 57¾ in.; over-all length, excluding control cabinet, 95⅜ in.; over-all depth, excluding control cabinet, 87¾ in.; maximum height of machine, 91 7/16 in.; size of control cabinet, 30 in. wide by 51¼ in. high by 19 in. deep; net weight of belt-driven machine, without fixture, 8,400 lb.; net weight of geared-head model, without fixture, 8,900 lb.; net weight of fixture 1,200 lb.

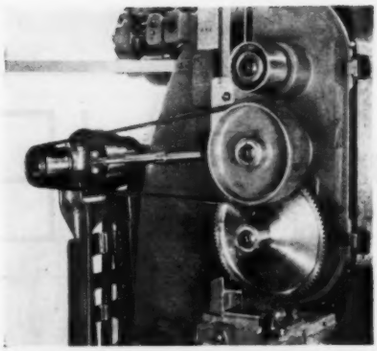


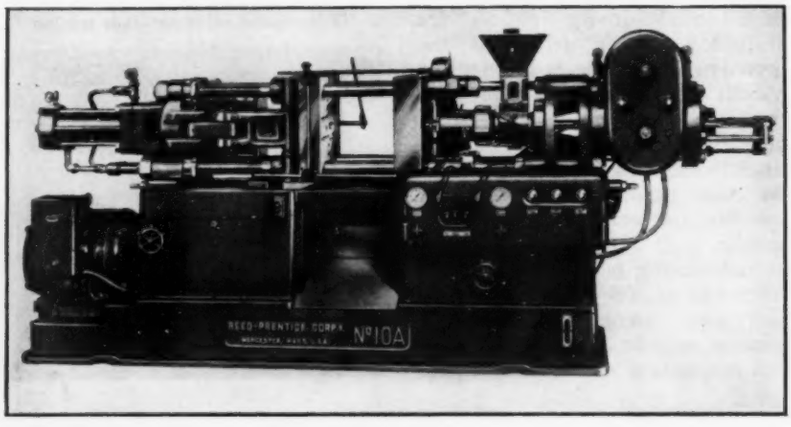
Fig. 3—Back-gearing permits use of one spindle at speeds down to 80 r.p.m. Maximum spindle speed for belt-driven model is 3,600 r.p.m.

Reed-Prentice Model 10-A Hydraulic Plastic Injection Molding Machine

The Model 10-A plastic injection molding machine offered by Reed-Prentice Corp., Worcester, Mass., incorporates a number of improvements over the No. 10 molding machine previously described (*AM*—Vol. 80, page 1054 and Vol. 81, page 304). The stationary side plate, cut from solid steel plate, has been increased to 4⅞ in. thickness. Thickness of the movable steel die plate has been increased to 4½ in. Pressure on material is variable from 2,000 to 21,000 lb. per sq. in. and capacity of the pump has been increased to give 120 in. per in. continuous material plunger speed.

Regular equipment now includes automatic indicating control pyrometer and two rheostats, one each for the front and rear of the heat unit for independent control of heat to front and rear heating bands. Improved timing units and relocation of timers and push buttons for more convenient operation are among the improvements announced.

An improved heating unit is claimed to give capacity up to 3½ oz. of molding material. A Nitralloy material plunger and a Nitralloy sleeve in the plunger cylinder are claimed to eliminate the chance of scoring. The machine requires a 15 hp., 1,200-r.p.m. drive motor, and weighs approximately 10,000 lb.



Hammond Type J Polishing Machine

A Geneva-rotated work table, with eight revolving work spindles, forms the work carrying section of the Type J rotary, automatic polishing and buffing machine offered by Hammond Machinery Builders, Inc., Kalamazoo, Mich. The revolving work spindles are connected by chain sprocket drives to a ball-bearing, worm-gear reducing unit which, in turn, is driven by V-belt from a motor in the base. This drive permits regulation of indexing and work-rotating speeds to meet requirements. Work table, shafts and spindles are mounted on dust-proof, grease-sealed ball bearings.

Frame of this machine is provided with necessary openings to permit access to the operating mechanism. Type JR polishing motors, left, are

fitted with extended spindles held rigidly on columns in a horizontal position and have a vertical adjustment by handwheel. Type JRH motors, right, have threaded spindle shafts mounted on cross slides with worm gear pivot action. All wheels are hooded and are equipped with two-way exhaust heads for carrying off dust.

Farquhar 4,000-ton Hydraulic Press

Of heavy construction to minimize deflection, this 4000-ton hydraulic press, manufactured by A. B. Farquhar Co., Ltd., York, Pa., has an overhead tank for pre-filling the main cylinders by gravity. The press can be closed quickly by means of two side rams which exert a pre-setting pressure on the material. After the main cylinders are filled, a pilot control valve applies main pressure of approximately 2,000 tons, then pressure is increased by means of an

75th Anniversary

On this distinguished occasion, the Stark Tool Company announces its INTEGRAL DRIVE PRECISION BENCH LATHE . . . the first lathe of its class with built-in, gearless drive, giving any speed at the turn of a wheel. Fashioned in its finest tradition by the Originators of the American Bench Lathe, this new tool has precision double-taper or anti-friction bearings, clutch, brake and other features which will interest the man who wishes the utmost in accuracy, easy handling and compactness.

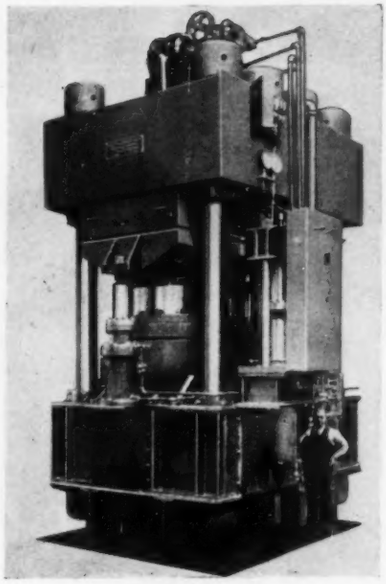
1862 "Stark" 1937

OF WALTHAM

intensifier to the total of 4,000 tons.

Side rams are double acting and are used for quick closing and opening. Maximum working pressure of the pumping unit is 2,000 lb. per sq. in. and maximum intensified pressure is 4,000 lb. per sq. in. Top and bottom members of the press are of welded construction, made of heavy structural shapes and reinforced with plate. Control of the machine is accomplished by means of a 4-pilot, 4-way operating valve.

Specifications: size of platens, 51x132 in.; size of opening, 14 in.; diameter of two main rams, 36 in.; maximum deflection of the press, 0.005 in. Operation of the intensifier is entirely independent, but the length of stroke under intensified pressure can be made indefinite without disturbing the pressure already applied.



Fellows No. 8 Enveloping Gear Generator

Designed for finishing gear teeth that previously have been roughed in another machine, the No. 8 enveloping gear generator, offered by Fellows Gear Shaper Co., Springfield, Vt., has capacity to finish gears up to 8-in. pitch diameter, 2½-in. face width and 4 diametral pitch.

The principle employed in removing metal by the enveloping process differs from conventional gear-cutting methods in that: (1) the tool and work are rotated together without control of any indexing mechanism, (2) cutting is accomplished by setting axes of tool and work askew to each other and by bringing the tool into intimate contact with the work under pressure, (3) the tool is rotated at high speed and traversed at slow speed, first in one direction to finish one side of the teeth, then reversed and rotated and traversed in the opposite direction to finish the other side of the teeth.

When tool reciprocation is not restricted, the tool is traversed for a distance slightly greater than the gear face width and one complete cycle finishes the gear. In cases where full face width reciprocation is restricted by a shoulder, the work is fed steadily upward into the tool, the later being reciprocated about $\frac{1}{32}$-in. to enhance the cutting action and improve the finish. This upward feeding cycle continues for a predetermined time, the tool making one or more cycles depending on the amount of material to be removed.

Tools used on this generator are made in a variety of types, depending upon the character and shape of the work and upon other conditions. Two-piece tools can be used for finishing spur and helical gears where there is no interfering projection on the work. Such tools are less expensive, both to purchase and to maintain, than those shown in Fig. 2. These are one-piece generating tools having a number of cutting edges. The tool shown at the left is known as the one-piece "slotted" type and is made with deep angular slots cut to the full depth of the teeth and on a helix, thus producing the multiple cutting edges. It is free cutting and is recommended for semi-finishing shoulder gears where the work requires two finishing cuts. When used for final finishing, this tool is ground to envelop the work. A "serrated" tooth type of tool is shown at the right in Fig. 2. A series of shallow grooves are cut on both sides of the teeth of this tool, thus presenting a multiplicity of cutting edges to the work. Such a tool is recommended for final finishing operations.

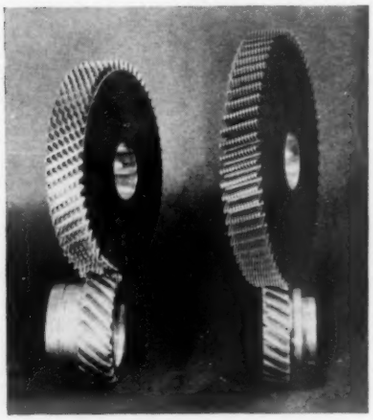
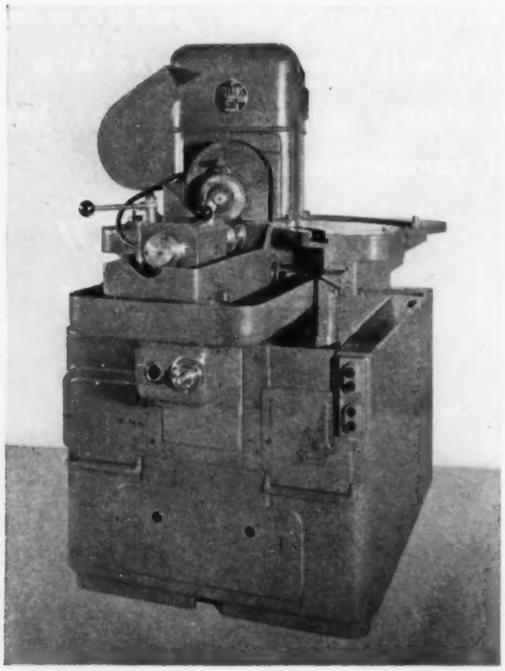


Fig. 2—One-piece enveloping tools of the slotted and the serrated tooth types are required where reciprocation of tools is restricted by a shoulder

Specifications: maximum face width capacity, 2½ in.; maximum pitch diameter, external, with standard fixture, 8 in.; maximum diametral pitch, 4; maximum helix angle, 45 deg.; maximum over-all length of machine, 64 in.; maximum over-all width of machine, 49 in.; maximum over-all height of machine, 67 in.; net weight of machine, with motors and electrical equipment, 6,300 lb. A 1-hp. constant-speed motor is required for the main drive unit and a 2-hp. constant-speed motor drives the tool spindle. Electrical control equipment furnished includes a main motor starter, a reversing starter for the tool-spindle motor, six interlocking contactors, various electrical interlocks, push-button stations and a terminal board. This control equipment is an integral part of the machine and is enclosed by a door.

Fig. 1—Spur and helical gears can be finished in the Fellows No. 8 enveloping gear generator



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"Jackman, the Research Belting salesman, said we'd get at least 1 or 2% more average machine production with Research Leather Belting over ordinary belting . . . or we could have our money back.

"Well, here are the figures . . . and they're up 3¼%! Translate that percentage into dollars, and you've got something. With an extra profit like that, we'd be crazy not to put Research Belting on all our drives."

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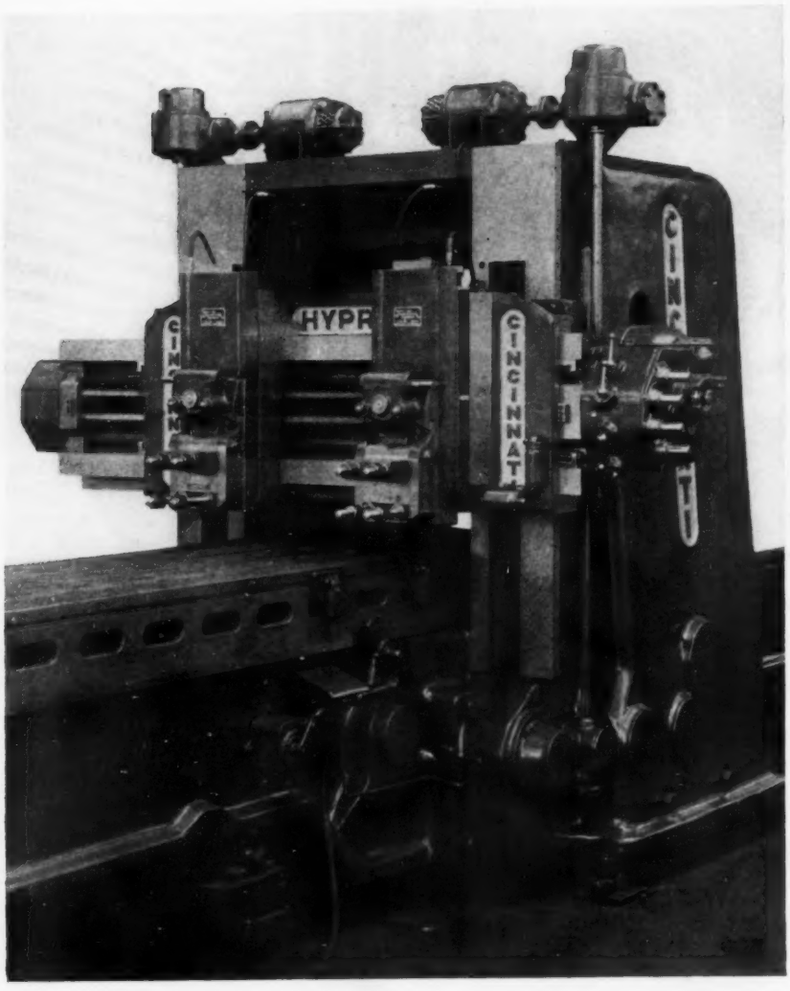

"Hypro" Frog and Switch Planer

The "Hypro" 42-in. frog and switch planer, developed by Cincinnati Planer Co., Cincinnati, Ohio, was designed primarily to meet the demand of companies engaged in the production of railroad track assemblies. It is also arranged for use in the production of automotive body dies. Cross-rail heads and side heads can be provided, either before or after shipment, to suit changes in requirements. Hand and power movements are controlled from the operator's side of the machine, shown in the accompanying illustration.

Rapid traverse movements for the saddles and tool slides are obtained from the two 5-hp., 1,800 r.p.m. torque motors mounted on top of the machine. The left-hand motor operates the up and down movement of both slides, independently or together, and the right-hand motor positions the two saddles lengthwise on the cross rail. Both motors are operated from the small drum controllers mounted on the right-hand head. Operating both controllers at the same time positions tools rapidly to any cutting position. Dynamic braking is used.

Mounted on the right end of the rail is the feed mechanism, which is operated from a drive shaft in the bed through a gear-box mounted on the bottom of the right-hand housing. Feed is obtained either before or after the cutting stroke has taken place and increments range from 0.01 to $\frac{9}{16}$ in. Maximum feed can be increased to $\frac{7}{8}$ in., should this be required. Engagement and disengagement of the feed at each reversal of stroke of the table is accomplished by a magnetic clutch which is energized from the main motor control panel relay. This clutch is of sufficient proportion to feed both slides and both saddles, imparting feed movement to both tools at the same time if necessary.

Both the bed and the table are of box-type sections and the table has four parallel T-slots spaced to suit customer's work-holding fixtures. These T-slots are fitted with rolled-steel sections to prevent chipping of under edges where bolt heads fit. Table top is also provided with large stop holes at the front end. Specifications for the machine shown in the illustration called for a fixed cross rail, doweled to the housings at three locations. Design, however, provides means for power elevation of the cross rail by mounting a motor-driven mechanism on top of the machine. This elevating mechanism is arranged to rotate elevating screws inserted in the face of the housing.

Design of slides and tool blocks is such as to provide a rigid support for the planing tool. An abutment on the tool block is machined to rest against a supporting point on the box, reducing both shearing and bending strains on the pin from which the block swings. Clapper boxes are of cast steel and are supported at their lower ends by a swivel stud of large diameter. This stud serves to resist vertical thrust and holds the box to the vertical slides. It is bored to form the cylinder for the pneumatic tool-lifting mechanism and also acts as a center for obtaining an angular movement of the tool-holder unit. Turning a square shaft by hand-wheel or crank inclines the tool-head to give an included angle of 45 deg.

Total height of the machine above the floor level is 114 in., width including main motor drive is 133 in. and the total length, when built for a 22-ft. table, is 48 ft. Total weight of such a machine is approximately 94,000 lb.

Federal Indicators

Three dial test indicators, similar in design to the Model 2 instrument previously described (*AM*—Vol. 81, page 585), have been announced by Federal Products Corp., 1144 Eddy St., Providence, R. I. These instruments are provided with a universal bar and movement consisting of a combination lever and direct contact crown gear so that friction and wear are reduced to a minimum. The universal bar is $\frac{1}{4}$x$\frac{1}{2}$x3-in. long. Adapter rods can be furnished.

The Model 1 instrument was graduated in 0.001 in. and has a range of 0.030 in. The same type instrument is available in metric graduations and Model 3, metric, is graduated in 0.005 mm. with a total range of 0.2 mm. Model 4, metric, is graduated in 0.01 mm. with a total range of 0.8 mm. All instruments have the same dial and the same outside appearance.

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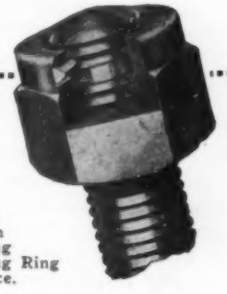
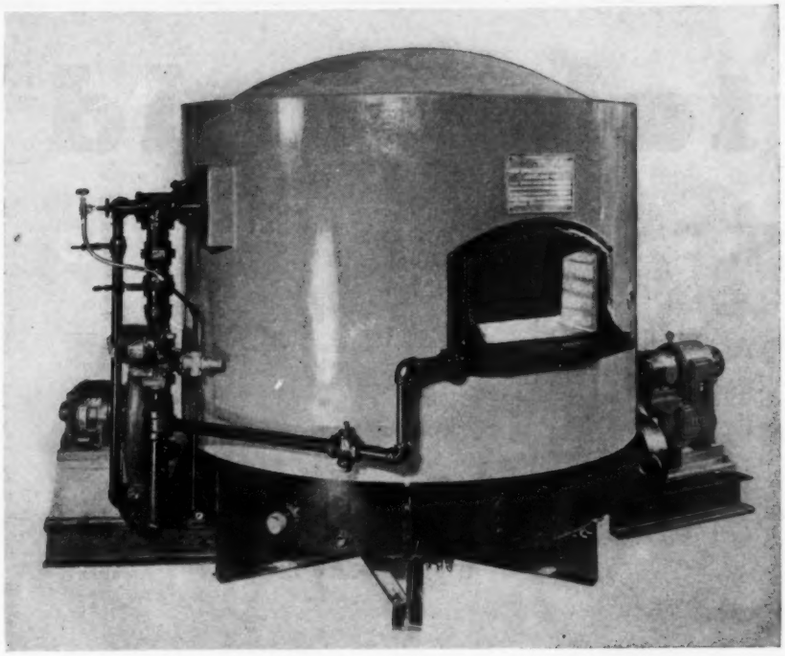


Cutout section showing Locking Ring in place.

Pat'd. and Pat's. Pending

Fig. 1510



"Gas Machinery" Water-Sealed, Rotary Heat-Treating Furnace

One attendant can charge and discharge the entire output of this rotary-hearth furnace offered by The Gas Machinery Co., 16100 Waterloo Road, Cleveland, Ohio. It is claimed that this furnace can be placed in the production line so that progress of material to and from it will be continuous. Designed originally for forging applications, this type furnace has been applied successfully to heat-treating and annealing operations in metal-working plants.

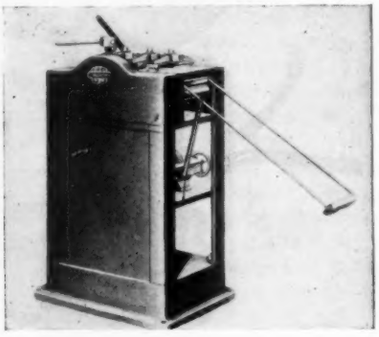
The hearth of this rotary furnace is water sealed and vapor formed above the seal is held to a minimum. A syphon-vent construction, built into the side wall of the furnace, carries water vapor out of the furnace so that it cannot enter the heating chamber. Main furnace flues, discharging the waste gases from the heating chamber at hearth level, are extended vertically downward to an annular opening built into tile blocks located directly above the water-seal. Sufficient circulation of water in the seal trough is recommended to keep the temperature of the water below 150 F. so that the volume of vapor to be exhausted by the flues will not place an unnecessarily large burden on their capacity. The trough is welded solidly to and forms a support for the furnace side wall. Hearth table steel base has a ring welded to its outer edge and extending downward into the water in the trough, thus completing the seal. Design has been improved by substituting a steel seal ring for the heavy cast-alloy leg previously employed. Water cooling for the table support rollers has been eliminated, since the sealing water has been found to keep the operating temperature below the safe limit to prevent galling the rollers.

Tangential burner firing and a circular combustion chamber are claimed to insure close and constant control of temperature and atmosphere throughout all parts of the heating chamber of this furnace. The only opening for admission of atmospheric air is the door and, by proper regulation of furnace pressure, inleakage at this point can be held to a minimum. With burner adjustment made for a slightly reducing atmosphere, a condition can be maintained within the heating chamber to insure a minimum of scale and surface decarburization of the heated material.

This furnace is equipped with burners, blowers, full automatic temperature control and drive for the rotating hearth. Motive power for operating the table is built for heavy-duty service and includes a variable-speed transmission to provide the necessary range of heating time for various sizes of stock. Rollers on which the table revolves are provided with Alemite lubrication valves, as are the center table guide rollers. An opening is provided in the furnace wall for inserting a pyrometer control couple.

U. S. Straightener for Coiled Stock

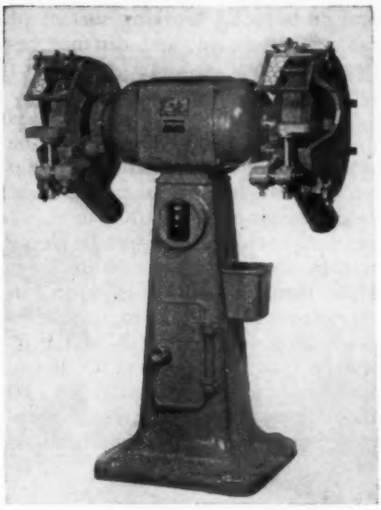
Power-driven straighteners for heavy, coiled stock have been announced by U. S. Tool Co., Inc., Ampere, N. J. These units are designed for use in conjunction with U. S. automatic coil cradles and slide feeds to provide a means for automatically removing stock from heavy coils, straightening it and feeding accurate lengths to the punch press. Straighteners are available in sizes to handle stock up to ¼-in. thick and can be furnished to handle any width stock.



All rollers are equipped with needle bearings and a simple, automatic roll adjustment keeps them parallel. New coils of stock may be inserted without disturbing the setting of the straightening rolls. A single movement of the operating lever releases feed rolls to start a new coil. These straighteners also can be used in conjunction with U. S. plain-stock straighteners for handling thin, springy material.

Clark 3-Hp., 1,750-R.P.M. Floorstand Grinder

Suitable for use on production work or for general tool grinding, the 3-hp. floorstand grinder, manufactured by James Clark Jr. Electric Co., Inc., 600-640 East Bergman St., Louisville, Ky., incorporates a totally inclosed motor in which the rotor shaft is mounted in precision-type ball bearings. The motor is rated for continuous duty at 1,750 r.p.m. with a temperature rise of 55 C. Motor



frame is small in diameter, permitting maximum wheel wear and maximum clearance for work. This grinder is equipped with a magnetic starter having overload and low-voltage protection and with inclosed safety guards having hinged covers. Guards are adjustable around the periphery of the wheel and are also adjustable for wheel wear. Equipment includes non-shatterable glass eye shields, tool rests with horizontal and vertical adjustment, and a water pot. Wheel guards are equipped with exhaust connection openings in the bottom.

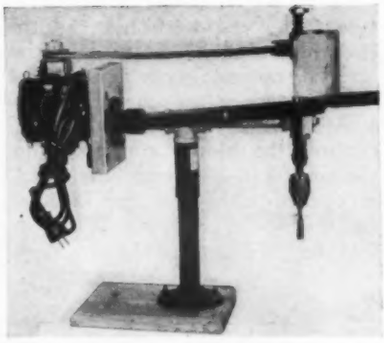
Specifications: over-all height, 48 in.; height to center of spindle, 39 in.; distance between wheel centers, 28 in.; size of wheels, 14x2x1¼ in. or 14x3x1¼ in.; floor space, 36x19 in.; size of base, 19x19 in.; net weight, 650 lb.

Carlander Model 4A Motor-Driven Screwdriver

Screws can be put in or tightened at the rate of approximately 1200 per hour with the Model 4A motor-driven screwdriver offered by Henry Carlander, 525 W. 146th St., New York, N. Y. This unit has a spindle movement of 2 in., enabling the operator to bring the screwdriver down to work placed on the bench. The screwdriver is held in the upper position by a spring catch when not in use. In the normal position, shown in the illustration, the end of the screwdriver is 5 in. above the bench and the 2 in. movement brings the screwdriver within 3 in. of the bench. This model has a 6-in. vertical adjustment, bringing the normal position of the screwdriver to a maximum height of 11 in.

When a screw is pulled up tight the spindle stops automatically through the release of a spring tensioned clutch. Tension on the clutch is easily adjusted through a slight movement of a ½-in. nut.

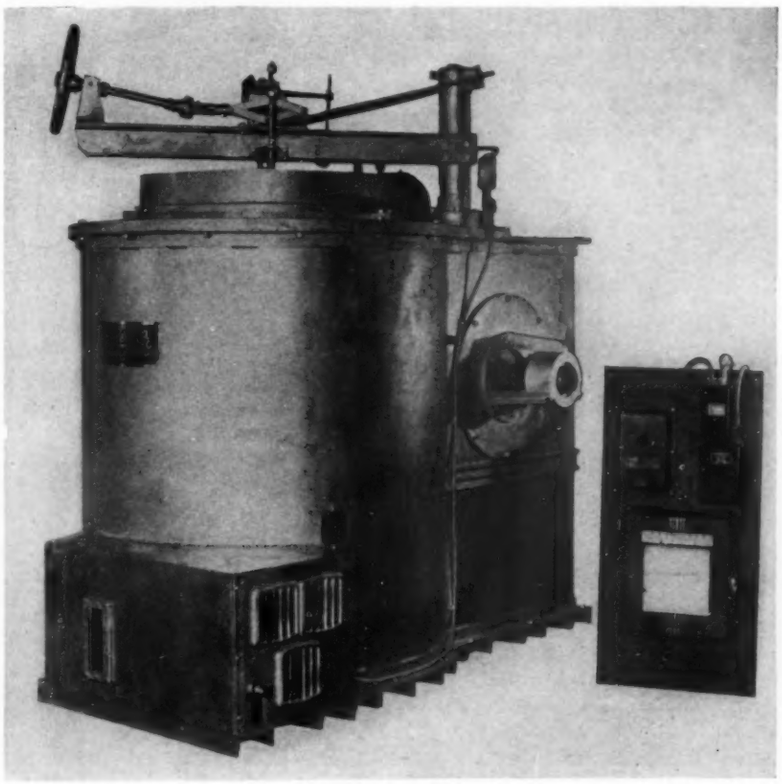
The Model 4B unit is the same as Model 4A, with the exception that it has no adjustment for height. In this model, the end of the screwdriver, in its normal position, is 3 in. from the bench and can, with the 2 in. movement, reach within 1 in. of the top of the bench.



Eclipse "Rotair" Air-Draw Furnace

The "Rotair" air-draw furnace, announced by Eclipse Fuel Engineering Co., Rockford, Ill., is a recirculating-type furnace in which the blower gives continuous and rapid circulation of the hot gases through the load. Blowers in each of the units have ample capacity to develop rapid circulation, which is claimed to eliminate any excessive temperature drop in the gases as they pass through the work. Blower circuit is interlocked with the protective circuit in order that none of the solenoid valves controlling the gas supply can be opened unless the blower is operating. Turbulence set up by the blower thoroughly mixes the fresh products of combustion and the recirculated gases before they are discharged into the distributing duct around the work basket.

When the gases reach the set operating temperature, the main burner is automatically shut off by the temperature control system, which consists of a thermocouple, a control instrument and a motor-operated valve. When the hot gases have given up sufficient heat in passing through the load to cause a drop in temperature below the fixed operating temperature, the control system automatically brings the main burner back into operation. This cycle is repeated as often as necessary to maintain a uniform tempera-



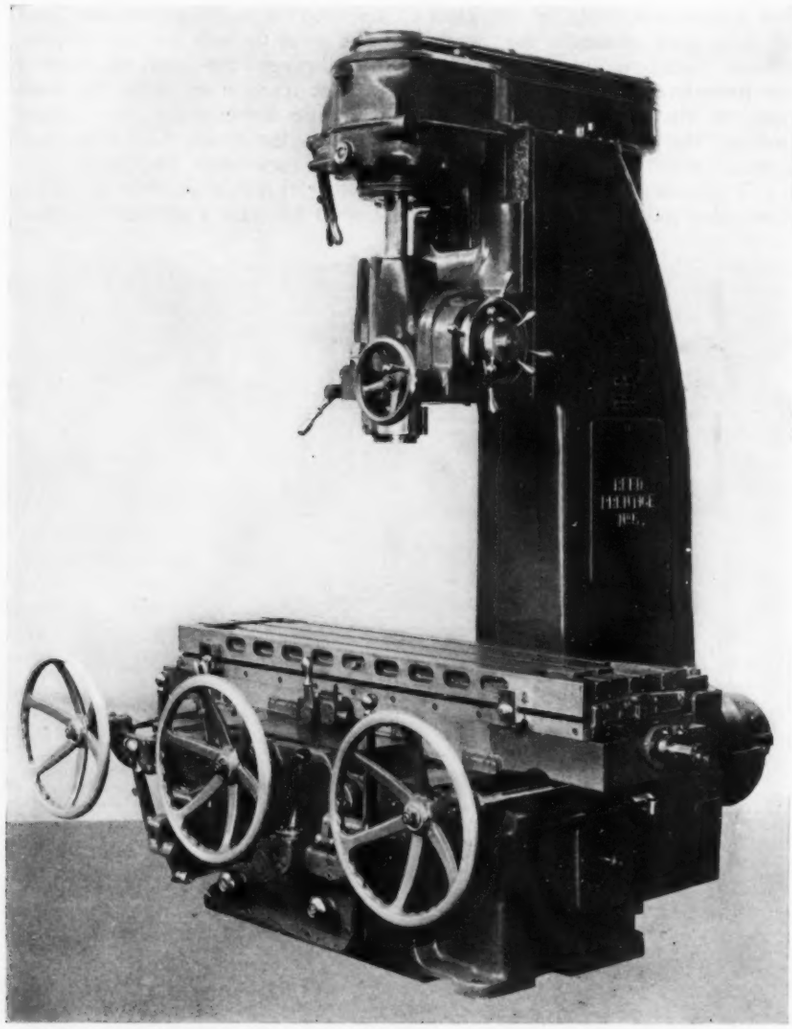
ture. After the work has had the proper soak at the control temperature, the operator turns a handwheel which operates the cover. This is fitted with a toggle switch which controls the blower circuit. Before the cover can be raised, this switch is opened and gases are shut off and the blower is stopped. When the unit has been reloaded, it is only necessary to push a single button on the control panel and blower and burner are again put into operation in the proper sequence.

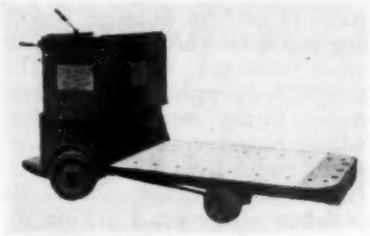
Seven sizes of the "Rotair" furnaces are available, with basket sizes ranging from 12 in. diameter by 16 in. deep to 28 in. diameter by 28 in. deep. Operating temperature range is 350 to 1,200 F.

Reed-Prentice No. 5 Vertical Miller

Belt drive construction has been replaced with a helical gear drive to the spindle in the improved No. 5 vertical miller and die sinker offered by Reed-Prentice Corp., Worcester, Mass. The entire top gearbox of the machine is equipped with helical gears mounted on shafts running in Timken bearings. Specifications of the machine are as follows: Longitudinal power feed, 48 in.; cross power feed, 16 in.; vertical adjustment of head on column, 15 in.; vertical feed of spindle, 9 in.; maximum distance from end of spindle to top of table, 30 in.; throat depth, 20 in.; distance from center line of spindle to face of column, 11¼ in. The table can be moved a maximum distance of 8 in. either way from the center line of the spindle with the cross feed. Rapid power traverse of 100 in. per min. is provided in either direction for both the longitudinal and cross feed. Working surface of table is 68x16 in. and distance between T-slots is 5 in. Height of table above floor is 33 in.

There are eighteen spindle speeds ranging from 17 to 600 r.p.m. in the standard range and from 34 to 1200 r.p.m. in the high-speed range. Eight feeds, ranging from 0.002 to 0.297 in., are provided. The spindle sleeve is 6 in. diameter and is 20 in. long. Hole through spindle is $\frac{11}{16}$-in. in diameter. Taper hole in spindle is made according to the N.M.T.B.A. standard of 3½ in. per ft. and a spindle adapter having a No. 10 B.&S. taper inside is provided. Shipping weight of the machine is 11,500 lb.





Wright-Hibbard Platform Truck

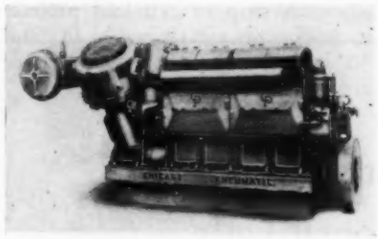
The platform-type, load-carrying truck illustrated, offered by Wright-Hibbard Industrial Electric Truck Co., Inc., Phelps, N. Y., features small over-all dimensions and a short turning radius, permitting it to operate in congested spaces. Size of platform can be varied to suit individual applications, with minimum dimensions of 29-in. in width and 34-in. in length. Any platform height from 6½ to 22 in. can be furnished.

C.P. Class W-CO Air Compressors

Arranged for mounting on a permanent foundation or on skids, the Class W-CO stationary compressors, offered by Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., are driven by Type 48 diesel engines. They are built in sizes having three or four engine cylinders, rated at 112½ and 150 hp. respectively, with two-stage compressor cylinders, having piston displacements of 655 and 830 cu.ft. per min., respectively, for a normal discharge pressure of 100 lb. per sq. in. at sea level. Compressor cylinder sizes are also available for other operating conditions.

The engine of this unit is started

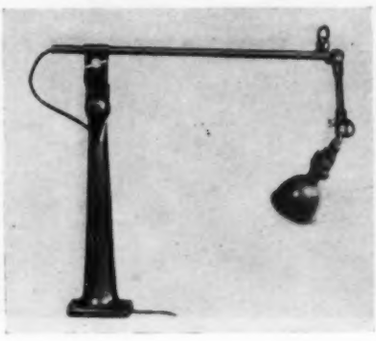
by compressed air, a small gasoline engine-driven air-starting equipment being included in the standard equipment. Engine and compressor are arranged for circulating water cooling. These units operate at 720 r.p.m. and have a maximum discharge pressure of 125 lb. per sq. in. at sea level. The largest unit measures 134-in. long, 78-in. wide, and 76-in. high.

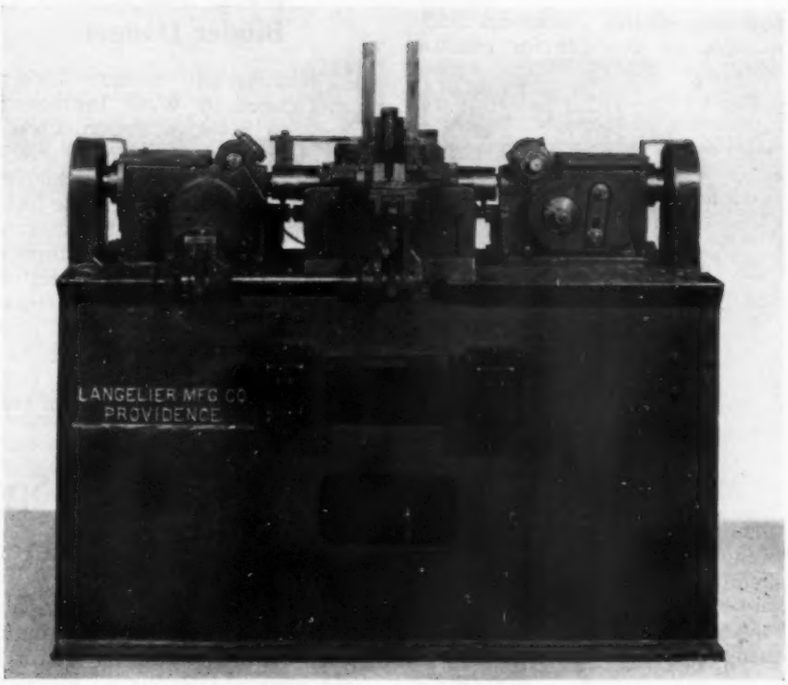


Fostoria Localite Lighting Units

Flexible "Localite" industrial lighting units No. 71 and No. 72, offered by The Fostoria Pressed Steel Corp., Fostoria, Ohio, accommodate standard double-contact candelabra bayonet-base type lamps in either the 6-8 volt or the 110–115 volt classifications. Model No. 71 consists of a reflector, a 15-in. long horizontal arm, a 5½-in. long auxiliary arm and a connecting friction-swivel joint. Standard studs are provided for mounting this unit on a machine part. Over-all length of this model, including reflector, is 26¼ in.

The No. 72 unit, shown in the accompanying illustration, has a 14-in. high cast-iron base and a 22-in. long horizontal arm. A 5½-in. long auxiliary arm, which supports the reflector, is connected to the horizontal arm with a friction-swivel joint. Over-all length, including reflector assembly, is 33¾ in. Both models are equipped with a standard Underwriters approved cord and rubber plug.





Langelier Double-End Threading Machine

This double-end threading machine, built by Langelier Mfg. Co., Inc., Providence, R. I., for threading door-knob spindles, consists of a magazine-fed, horizontal, duplex-opposed machine using two No. 11 drilling units driven by individual motors.

Parts are loaded into a vertical magazine and shifted to the operating station by means of a cam actuated by the left-hand unit. This unit also has a cam-actuated device for clamping the part.

The right-hand unit is started in operation by a limit switch on the left-hand, or control unit. This limit switch closes a circuit to operate a solenoid which trips the clutch mechanism and the head then makes one complete cycle and stops. Self-opening die heads are used and, after the operation is completed, parts are ejected automatically.

Procunier "Universal" Tapping Machine

Designed to tap a wide range of materials and sizes, the "Universal" tapping machine announced by Procunier Safety Chuck Co., 14 S. Clinton St., Chicago, Ill., has five operating speeds and two interchangeable tapping heads. An arrangement of long helical springs, adjustable over a wide range, maintains preset tapping and reversing pressures independent of the operator, thus facilitating precision tapping at high speeds with maximum protection.

The five operating speeds range from 385 to 2,240 r.p.m. and the two interchangeable tapping heads afford a capacity ranging from a No. 8 tap to ⅝-in. diameter taps inclusive. Automatic, continuous lubrication of the tap is provided and, through convenient timing and volume adjustment, lubrication can be set to give correct flow of lubricant

as well as automatically to start the flow when desired. Additional chuck spindles are available for external threading.

Precision hand-screw height adjustment is provided for the work table and a precision depth stop adjustment makes possible tapping blind holes.

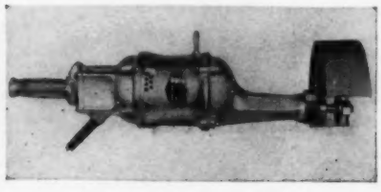
Imperial All-Metal Solder and Flux

A high-tensile-strength solder and all-metal flux for low-temperature soldering of such metals as aluminum, cast iron, die-cast metal, stainless steel and monel has been announced by The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. Although this solder is applied at low temperatures, only slightly above those used for ordinary soft solders, it is claimed to form a bond having a high tensile strength. It is also claimed that this solder will withstand temperatures high enough to permit its use in repairing hot water tanks and valves and pipes on hot water or low pressure steam systems.

The solder is designed for use in connection with the special flux which is furnished in conjunction with it, the flux being used to dissipate the oxides on the surface of the metal preparatory to the application of solder. Blow torches, welding torches or large soldering irons can be used for applying the solder, which melts at approximately 500 F.

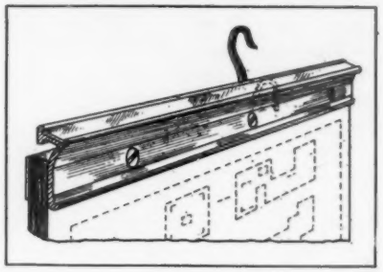
B.&D. 8-In. Portable Electric Grinder

Designed for use with specially-bonded wheels for high-speed, heavy-duty service, the 8-in. portable grinder announced by The Black & Decker Mfg. Co., Towson, Md., has bearings set at the extreme ends of the spindle to absorb side thrust. This tool is claimed to be suitable for grinding, buffing and polishing, as well as for grinding off rivets and studs. A sheet-metal wheel guard is furnished.



Wade Blueprint Binder Hanger

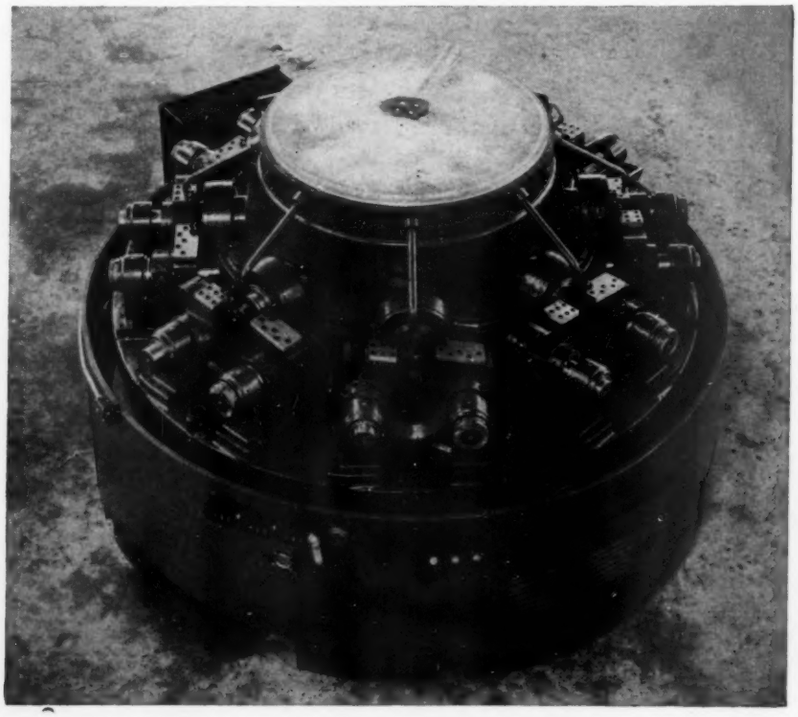
A combination binder hanger manufactured by Wade Instrument Co., 2246 Brooklyn Station, Cleveland, Ohio, holds up to 75 blueprints. Three telescoping binder screws with a metal strip at the back hold the prints. The center hook is made of steel and can be turned down so that prints may be rolled for transportation or turned back for reference. A renewable title strip is provided and may be lettered to suit. The renewable title strip slides in a T-slot at top of the hanger and is sloped at a visible angle. A strip of celluloid protects it. Stock sizes are 18 in., 24 in., and 30 in. Other sizes may be made to order.



Partool Special 8-Spindle Rotary Horizontal Lathe

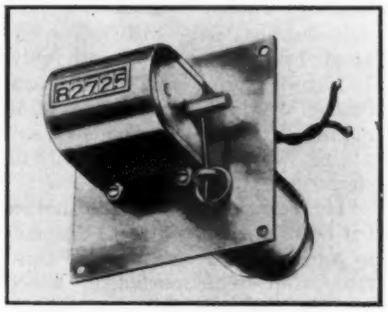
Designed to machine universal-joint flange bodies, this special 8-spindle rotary horizontal lathe has recently been completed by Partool Machine Co., 9111 Schaefer Road, Detroit, Mich. The large 8-spindle head is carried by an anti-friction ball bearing on a 93-in. diameter fabricated steel base. Spindles can be fitted in plain or anti-friction bearings.

Tool blocks are mounted on large diameter shafts to assure rigidity. These blocks are cam actuated. Work holders are designed automatically to clamp and unclamp the part before and after machining. All reciprocating parts have four-speed lubrication from a central oiling system. Coolant is pumped up into the reservoir located on top of the machine, from which it is fed to the work in ample quantity. Provision is made for removing the chips without interfering with the action of the tool blocks. Chips are dumped out at the rear of the machine, into a container, as the machine revolves. Approximately 900 flange bodies are produced per hour. Net weight of the machine is 16,000 lb.



"Production" Type S.E.C. Electric Counters

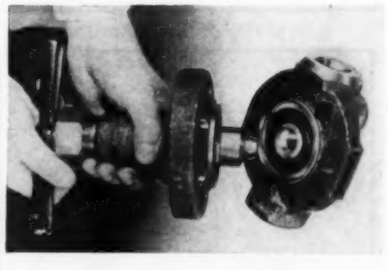
Type S.E.C. electrically operated counters, announced by The Production Instrument Co., 1325 So. Wabash Ave., Chicago, Ill., are equipped with large legible number wheels having black figures on a white background. Five number wheels give a capacity of 99,999, which is ample for most requirements in small counters. The operating relay actuates



the lever arm of the counter, which has a throw of only $\frac{1}{2}$ in. A positive action prevents skips or overthrow of number wheels. These counters measure $1\frac{7}{8}$x$1\frac{1}{2}$x$1\frac{3}{4}$ in., and are mounted on a $2\frac{7}{8}$ in. square plate. The operating relay is attached below the base plate and extends $1\frac{7}{8}$ in. below the surface. Since the case cover is fastened at the bottom and the counter is a non-reset instrument, tamperproof installations are easily made.

Hancock "Duravalves"

Developed especially for high pressure and high temperature service, the "Duravalve" steel valve announced by The Hancock Valve Div. Manning, Maxwell & Moore,



Inc., 3 Elias St., Bridgeport, Conn., are fitted with internal Stellite seats. These valves are claimed to be suitable for pressures of 1,500 lb. at 950 F. and are made in one basic size, then tapped, or bored for welding, for $\frac{1}{2}$, $\frac{3}{4}$ or 1-in. diameter heavy-duty pipe.

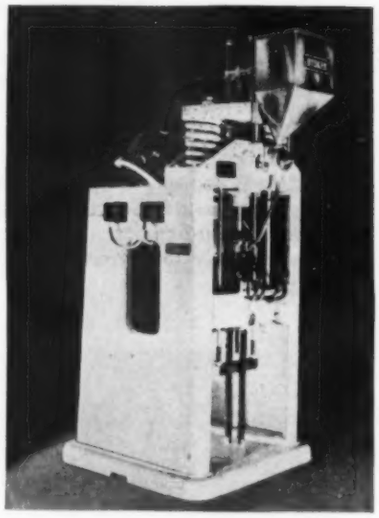
Stokes Plastic Molding Machine

A completely automatic molding machine, designed to mold thermosetting plastic materials of the phenolic base and urea compound types, is offered by F. J. Stokes Machine, 5930 Tabor Road, Olney P. O., Philadelphia, Pa. With the hopper filled, the metering device adjusted to feed the proper amount of molding powder and the machine set for correct breathing and curing time and mold temperature, the production cycle will be repeated, automatically and without operating attention an indefinite number of times. Any interruption in the continuity of discharge of finished parts stops the machine. All customary operations of the molding cycle, such as filling the mold, closing, cleaning by air-jets, curing, opening mold, ejecting the finished part and cleaning the mold, are performed automatically. It can be set for breathing or de-gasing when desired. The machine can be furnished with top and bottom knock-outs and with a stripper mechanism when required.

As in conventional molding methods, output of the machine depends largely on the curing time required. A small article, with light wall sections, can be molded in about 2 min. Larger, heavier pieces may take 6-7 min. Pieces ranging from 1- to $1\frac{3}{4}$-in. deep, depending on shape, can be molded. Changing molds and setting controls for different parts is claimed to require from 30-60 min. time.

The machine is intended primarily for use with single-cavity molds of the positive type and small-lot orders can be handled economically. It is completely self-contained, requiring only electrical and air connections. An up-stroke and a down-stroke limit switch, together with an operation check unit, safeguard the machine against damage to either mold or mechanism. The operating check is a trap device through which each ejected molded part must pass, the trap being the control of an interlocking circuit that keeps the machine in continuous operation, or stops it should there be an interruption in the flow of parts. Additional protection is afforded by a spring suspension method of supporting the mold, making it practically impossible to apply pressure sufficient to damage either punch or mold.

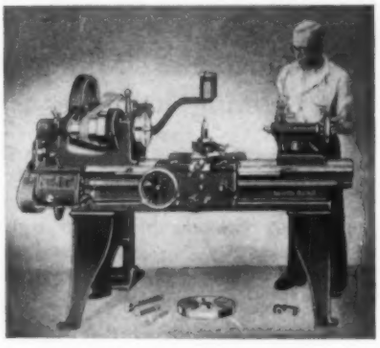
Feeding device will handle any free-flowing granular material, and is adjustable to feed from 0.9 to 5.26 cu. in. of material per cycle. The



machine occupies 36x42 in. floor space, stands 78-in. high and requires a 3-hp. ram-drive motor. A separate 1/50-hp. control-drive motor is used with a speed reducer. This motor is operated by a "Microflex' 2 to 20 min. cycle timer.

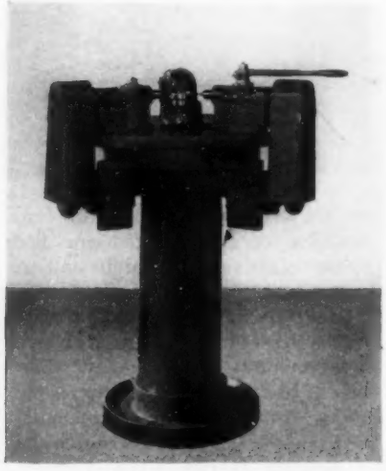
South Bend Adjustable Lathe-Drive Mechanism

A pedestal-type, adjustable motor-drive unit, available in five sizes for use with 9- to 16-in swing lathes, is announced by South Bend Lathe Works, 426 E. Madison St., South Bend, Ind. The drive mechanism is mounted on a pedestal at the back of the lathe and power is transmitted from the motor to the countershaft by V-belts. This countershaft is in the same horizontal plane as the headstock cone pulley of the lathe and power is transmitted from the countershaft to the lathe pulley by flat leather belts. A reversing switch, located near the operator's position, permits the oper-



ator to start, stop or reverse the rotation of the spindle. An adjustable tension brace located between the countershaft and the lathe equalizes the pull of the belt.

A turn-buckle adjustment on this unit permits adjusting the belt for any desired tension and a tension release lever permits shifting of the belt from one step of the cone pulley to another. When this lever is pulled towards the operator, the motor drive is tilted forward on its pivoting frame sufficiently to permit moving the belt.



Langelier Three-Way Drilling Machine

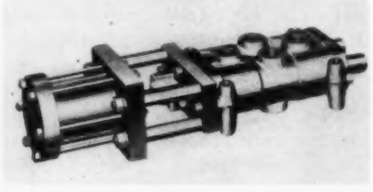
Designed for drilling holes 120 deg. apart, this three-way floor-type drilling machine is assembled with three horizontal, hand-fed drilling units by Langelier Mfg. Co., Providence, R. I. Heads are interconnected so that they will feed simultaneously. Suitable fixtures can be mounted on the machine table. Individual motors are used to drive the drill spindles and the machine can be arranged for tapping operations by using reversing tapping chucks to fit the drill spindles. In case the machine is to perform both drilling and tapping, cone pulleys may be provided in order to change the spindle speeds.

Westinghouse "Millite" Lighting Reflector

"Millite" lighting units, announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., are designed to provide maximum light output under severe service and atmospheric conditions. They are claimed to be especially suitable for use in heavy industry applications where moisture, smoke, dust, dirt, acid fumes or hard use preclude the use of ordinary, open-type high-bay units. The "Millite" unit is dust-tight and vapor-proof and the reflector is treated by the "Alzak" process. Complete unit consists of a steel housing, a removable reflector and a hinged glass cover. It is designed for use with 750, 1,000 or 1,500 watt lamps.

Hunt Pilot-Operated Hydraulic Valve

Embodying the same no metal-to-metal wear principle and small number of moving parts used in the line of "Quick-As-Wink" air control valves, this pilot-operated hydraulic valve announced by C. B. Hunt & Son's Co., Salem, Ohio, is assembled in a drop-forged bronze housing. Valving operation is accomplished by the motion of valve bodies or plungers. The illustration shows a



4-way pilot-operated valve. These valves are also available in 2-way and 3-way models. All models are made in $\frac{1}{2}$-, $\frac{3}{4}$- and 1-in. sizes for either 1,000 or 2,000 lb. per sq. in. working pressure.

Valve bodies or plungers are made of stainless steel. These are free-floating in special packings, avoiding metal-to-metal contact. Balanced port action used in conjunction with the valving ring is claimed to provide satisfactory performance in hard service.

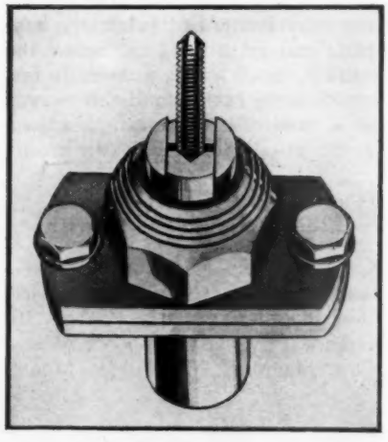
These pilot-cylinder valves are designed for installations requiring remote or automatic control. The 4-way unit is suitable for use with double-acting cylinders; the 3-way valve is recommended for single-acting cylinders.

Alco Drill Chucks and Tap Holders

Alco Tool Co., Bridgeport, Conn., has designed a drill chuck and a tap holder, either of which will fit any screw machine and requires no bushing. The drill chuck is adjustable to any size drill within its range by means of a wrench only. It is full floating and permits concentric drilling. Cams on existing machines are not affected and ample provision is made for plenty of clearance.

The front of the Alco tap holder has been tapered to a small diameter to provide ample clearance for rapid cross slide tool movement, which enables speed-up of cam timing. Holder has floating alignment and is adjustable.

Both the drill chucks and the tap holder are available in capacities from $\frac{1}{32}$-$\frac{1}{8}$ in. to $\frac{7}{16}$-$\frac{5}{8}$ in.



Films Cause Plating Trouble

A clean surface is well recognized as a necessity in successful plating. Unfortunately, metal sufaces which seem perfectly clean to the eye may be covered with thin film injurious to plating action.

Films which repel water are, of course, easy to detect and the necessary steps to remove them can be taken as required. Such films generally are oil or grease and are readily removable by a caustic dip.

Films which do not repel water are found out only when the plating operation fails. The most common of this type is the oxide film. Being transparent, it is difficult to detect unless it is of appreciable thickness. Film is easily removable by an acid dip, and such dips have been commonly adopted as one of the steps in plating operations.

According to the Oakite *News Service,* a film may be produced on the metal surface due to the nature of the cleaning fluid itself. If alkaline cleaning solutions are used, care must be taken to keep the alkalinity high enough. When the ratio of alkali to silica in the solution drops too low there is a tendency for silicate film to form. Acid or cyanide dip does not remove this type of film but strong caustic soda solution will.

Research has shown that very small amounts of protein matter in solution will form a film on metal surface that is sufficient to prevent adhesion of an electro-deposit. Such material may be added to the solution by, for example, the temporary storage of plating solutions in containers which have not been thoroughly cleaned.

Certain chemicals have the property of producing what is known as a passive condition on metal surfaces. This condition is in some cases known to be due to an oxide film but when the usual treatment for an oxide film is not effective in correcting the condition other types of films must be suspected. Some of these are caused by chromic acid or its salts. With the perfection of bright nickel plating it becomes possible to eliminate the polishing operation between the nickel plating and chromium plating operation. As a result, reracking between the nickel plating and chromium plating operations becomes unnecessary. Therefore, the racks should be cleaned between each sequence of operation. In spite of the care used the coatings on the racks will either become porous or loosened sufficiently for a small amount of chromic acid solution to be absorbed and carried back into the cleaning bath.

Careful investigation has proved that one ounce of chromic acid, in 1500 gallons of cleaning solution is sufficient to cause the formation of a film which will prevent nickel from adhering to brass where the usual procedure is followed after cleaning. Contamination of the cleaning solution with chromic acid results in a nickel deposit which is dull, granular, or even produces a white flaked deposit which can be easily brushed off.

It is therefore obvious that all of difficulties encountered in securing satisfactory adhesion cannot be attributed to failure of the cleaning solution. Very small amounts of contaminating substances in the solution, in the subsequent dips or rinse waters, or even in the plating solution itself are capable of causing trouble. Only by recognizing this fact and using care to avoid such contamination can trouble from poor adhesions due to non-water-resistant type of films be avoided.

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Danish Diesel Ship

Facts long held secret by Danish authorities regarding the operation of the first of the diesel engine ships, the M. S. Selandia, now the "Norseman," have been published in this country. Practically all major parts of the ship's motors have been replaced in the 25 years of her service. In the first 20 years all cylinder sleeves were renewed once, and they have been replaced within the last five. Cylinder covers have been refitted two or three times, and new crank shafts have been installed. Repairs for the years 1926–31 on the main and auxiliary motors averaged about $5,000 annually.

Only one major alteration in the original machinery is reported. This has been the change in the two auxiliary compressors, which delivered air under 20 atmospheres pressure to the main containers which in turn, with the main compressor, produced intake air under 60-atmosphere pressure. This proved unsatisfactory, and the change was made to main the compressor which now delivers intake air under 60-atmosphere pressure direct, without pre-compression.

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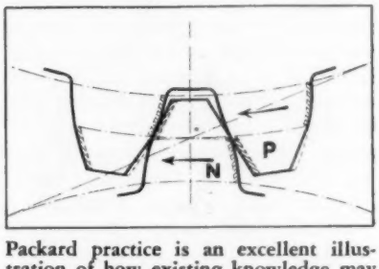
Trends in Transmission Gears

Gears in automobile transmissions are probably subject to greater stresses, due to abuse as well as to use, than those in almost any other mechanism. On this account the changes that have taken place in the design of these gears should be of value in many other industries. The data given here are from Modern Methods of Gear Manufacture, an interesting booklet issued by the National Broach & Machine Co., Detroit. Many are the changes made since 1910 in helix angles, pressure angles, diametral pitch, tooth profile and forms.

Helix angles have gone as high as 60 deg. but between 30 and 40 deg. is now in general use.

Pressure angles went up to 30 deg., with present practice 12 to 17 deg. for helical and 14 to 20 deg. for spur gears. It is believed they will in the future have a range of from 12 to 20 deg.

Diametral pitches began at 6 D.P. while a few used 5 D.P. This has varied up to 16 D.P. and 16 to 14 D.P. in experimental cars. Indications are that pitches will range from 10 to 14 D.P.



Packard practice is an excellent illustration of how existing knowledge may be used to modify tooth form. This drawing shows how a section of the addendum (under dotted area) is removed so that the first contact of the region at "P" takes place below the pitch line of tooth "N"

Tooth profile has undergone numerous modifications. This at one time reached the point of no contact above the pitch line. Recent practice has made the tooth about 0.0005 in. thicker at the pitch line. Another modification is to crown the face of the tooth so that it is slightly thicker at the center than at the ends. This has been found beneficial when the difference in

thickness between the center and the ends does not exceed 0.0001 in.

Stub teeth in transmissions came into use in about 1915, reached their peak of popularity in 1920-25 and seem to have practically faded out of the picture in about 1935.

Packard has adopted the practice of changing the profile so that the teeth will not contact until they approach the center line between the shafts. To secure this action the addendum surface on each mating gear is removed on one side. In this way the first contact occurs approximately on the centerline and will continue down the dedendum as shown. The area of contact is shown by the shaded portion.

To secure this result Packard increases the "carry-over" of tooth contact by using a 46 deg. helix angle, 10 D.P. and about a 14 deg. pressure angle.

Kinks Did It—Why?

REGINALD HINER

I do not pretend to understand why the kinked rod removed the arbor (*AM*—Vol. 80, page 893) but I know that it will do it because I have tried it several times successfully since reading Mr. Murdock's article. In a very difficult case I saw a burly machinist trying to batter out a stuck arbor by striking on a piece of cold-rolled steel with a hammer that weighed at least 10 lb. He was doing more damage to the spindle bearings than would have been caused by five years of ordinary use.

I have read the article by Mr. Murdock (Vol. 81, page 414) in which he advocates a thin steel washer between the extracting nut on the arbor and spindle nose. That is all right in so far as it goes, but I would suggest that thoroughly coating the washer on both sides with powdered graphite would add much to the pulling power of the nut.

Of all the discussions that have been provoked by Mr. Murdock's article, that of Francis W. Shaw (page 332) contains an ambiguous statement. I think Mr. Shaw owes it to readers who are apparently so much interested in this subject to fully explain what he means when he says, "—to force out the arbor than in the useless compression of the bar, *and the equally useless attempt to move the machine.*"

I feel constrained to criticize the suggestion offered by N. V. Smith (Vol. 80, page 580) who advocates tapping the hole in the rear end of the spindle for an extra-heavy pipe nipple and using a grease gun to force out the arbor. It seems to me that to tap a taper thread in the straight hole of the spindle would alone entail a far more difficult job than bending a few kinks in a brass rod. Besides, milling machine spindles are heat-treated for toughness and to resist wear. If the hole could be tapped without breaking off the tap in such a spindle, the operator would be lucky, to say the least.

Of all the methods proposed, it seems to me that the one by Mr. Smith would be the most costly and the most uncertain in extreme cases. A small brass rod and the "kinks method" could not be accused of doing any damage to the machine.

IRA S. WILLIAMS

In an article under the above title (*AM*—Vol. 81, page 700), Robert S. Alexander rightfully disclaims the authorship of the article of the same title and appearing under his name

GORTON DUPLICATORS

Dies Can't Come too Intricate

No pattern for a die or mold can be too complex for the Gorton Duplicator to reproduce accurately. Deep serpentine grooves, sharp shoulders, steep angles, vertical sides, and any kind of difficult shape can be followed with ease and speed.

Gorton Duplicators are particularly efficient on small, intricate dies and molds requiring careful workmanship. Their sensitive controls permit the use of cutters down to .030" dia. for fine work.

Example No. 1315-D — Lower half of die for die casting coin chutes for a vending machine. Die block was oil hardened tool steel. Production time, formerly over 100 hours, was reduced to 36½ hours with Gorton Duplicator. Actual cutting time on Duplicator was 29½ hours, including spotting the ejector pin holes to permit drilling instead of jig boring.

The new die was held to within .001" in all dimensions of the original, with certain sections being held within .00025". Gorton single flute cutters .070" to ⅜" diameter were used. Spindle speeds ranged from 950 to 6000 RPM. Deepest tool marks on die were .0005", average being .00025".

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(*AM*—Vol. 80, page 1088) advocating placing a strain on the arbor by utilizing the cross-feed screw and its nut while jarring the metal adjacent to the spindle in an effort to put it in vibration and release the arbor.

Mr. Alexander is further criticised in an article by Laurence F. Southwick (Vol. 81, page 762). To save Mr. Southwick from further embarrassment, I wish to state that the disputed article was written by me.

However, my method was not intended to be interpreted as a general practice, but as a harsh remedy applied to an already much abused piece of equipment of questionable condition and accuracy. My assumption relative to the condition of the machine was based on the fact that its condition originally outlined by Mr. Murdock (Vol. 80, page 893) seldom happens in the toolroom or the shop where the requirements are exacting and the personnel is well trained in the rudiments of machine tool operation.

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TRADE PUBLICATIONS

AUTOMATIC LATHES "More Minutes Per Hour" is the title of a folder illustrating special purpose set-ups on Duomatic lathes manufactured by The Lodge & Shipley Machine Tool Co., Colerain, Cincinnati, Ohio.

BEARINGS "Mechanical Properties of Some White Bearing Metals and Other Tin-Base Alloys at Various Temperatures" by C. E. Homer and H. Plummer has been made available by the International Tin Research and Development Council, L. J. Tavener, U. S. Representative, 149 Broadway, New York City. This booklet gives data on tensile and Brinell tests of typical tin-base bearing metals and on alloys made by adding cadmium to them in varying proportions. The booklet is profusely illustrated with pictures and diagrams and concludes that up to 3 per cent addition of cadmium causes an improvement in strength and hardness, but above this amount these advantages are offset by loss of ductility. Also available is a study, "The Tensile Properties of a Series of White-Metal Bearing Alloys at Elevated Temperatures" by H. Greenwood. The tensile behavior of white-bearing alloys at temperatures up to 175 deg. C., the effects of addition of lead and cadmium were tested and are reported here. It was found that cadmium was of little benefit at high temperatures and the effect of 4 per cent of lead is also not beneficial at the higher temperatures.

BEARINGS The reader is aided in visualizing the micrographic structure of Durex Bearings by the use of a Macyscope which is included with the "Moraine Handbook of Direct Bearings" made available by the Moraine Products Div., General Motors Corp., Dayton, Ohio. Bearing specifications and information on press fits and bearing installations are included in this 38-page booklet.

BERYLLIUM COPPER The Riverside Metal Co., Riverside, Burlington Co., N. J., offers a 28-page booklet discussing the properties and applications of Beryllium copper.

BOX TOOLS Roller-bearing box tools, designed for use on B. & S. automatic screw machines, are listed in a four-page folder offered by Banner Mfg. Co., 1873 Clybourn Ave., Chicago.

BRAKES Bulletin GEA-1518 of the General Electric Co., Schenectady, N. Y., gives specifications and

descriptions for the CR 9516 Shoe-Type Thrustor Brakes for a.c. motors.

CAST IRON The International Nickel Co., 67 Wall St., New York, N. Y., has made available a reprint of an article, "Cast Camshafts and Crankshafts Possess Many Advantages," by Fred J. Walls. The article includes a discussion of the use of cast iron for highly stressed machinery parts and includes a general description of foundry practices.

CHONOLOGS Three new models of Chronolog production control instruments are described in a booklet published by the National Acme Co., 121 E. 131 St., Cleveland, Ohio. Booklet includes explanation of Chronolog operation, uses in industry and methods of controlling and measuring idle equipment time.

COMPRESSORS Stationary and portable diesel engine-driven air compressors are described in Bulletin No. 762 of the Chicago Pneumatic Tool Co., 6 E. 44th St., New York. Compressors have capacities of 650 to 700 cu.ft. per min.

CONTACTORS The size 00 a.c. contactor, CR 2810 is described in Form GEA-2577 by the General Electric Co., Schenectady, N. Y. The compact magnetic switch is designed for relaying control circuits.

CONTROL VALVES Bulletin No. 461, issued by The Bristol Co., Waterbury, Conn., describes the line of "Synchro" diaphragm control valves and gives information regarding constructional features and operating characteristics.

CARBURIZING The Hevi Duty Carburizer is described and illustrations show its uses in the metal-working field in Bulletin HD 937 which may be secured from the Hevi Duty Electric Co., Milwaukee, Wis.

COUPLINGS Data sheets covering the prices of flexible couplings manufactured by the Ajax Flexible Coupling Co., Westfield, N. Y. have been combined in a new catalog for the convenience and information of engineers, draftsmen and purchasing agents. Blue-prints of the various types of Ajax couplings are included.

DISPLACEMENT METERS— Rotary Displacement Meters are described by The Roots-Connersville Blower Corp., Connersville, Ind., in their Bulletin 40-B-12. Not only are the general operating principles of the meter described but also meters for smaller volumes than listed in previous bulletins are included.

DRILL SIZES Engineering Bulletin No. 142 of National Twist Drill & Tool Co., Detroit, Mich., has been designed for binding in regular size folder and gives information on diameters, areas, and displacements of wire gage and letter size drills.

ELECTRODE HOLDERS Specifications for Jackson insulated electrode holders are given in a new 8-page folder, Jackson Electrode Holder Co., 6553 Woodward Ave., Detroit, Mich. Prices of holders and of replacement parts are listed.

ENAMELING A system of matching colors with basic oxide is outlined in the booklet, "Solving the Color Problem," published by the Porcelain Enamel & Mfg. Co., Baltimore, Md. Enamelers may secure free copies of this booklet which is designed as a handbook on color matching in porcelain enameling plants, with instructions on 40 different colors.

FLUID POWER Standard variable- and constant-displacement hydraulic pumps and motors, having normal

Successful Ways TO CUT CLEANING COSTS

WHEN any material or method gives real promise of reducing your costs, speeding production or improving quality of work you want to investigate it! Ability to do these things for plants everywhere accounts for the recognized leadership of Oakite materials on all types of metal cleaning.

Reduces Cost Almost in Half!

Here is a plant, for example, that makes scissors. The problem was to remove scale, salts and oil picked up in the hardening operation. Their old method cost as much as $56.00 per batch of 502 baskets of work. Then a simple change to Oakite methods and materials cut this cost to $32.50! Nearly half the former figure!

Another plant was up against removing an obstinate ground or primer coat as well as the surface or top finish. Even two days boiling in a strong alkali didn't do the job right. And now, in the easy, sure Oakite way, this work is done successfully in six hours.

What economies can Oakite cleaning make possible in your plant? There's only one way to find out . . . and that is to have an Oakite Service Man call and discuss this important matter with you. Write.

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capacities from 2 to 150 hp., are listed and described in a 56-page bulletin, No. 47000, issued by The Oilgear Co., 1319 W. Bruce St., Milwaukee, Wis. Construction, principal of operation and application of these units are fully discussed.

FURNACES Broadside "T" includes for the first time in a single publication a description and specifications for the complete line of Vapocarb-Hump and Homo furnaces for hardening, tempering and nitriding. It may be secured from Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

HARD-FACING A revised edition of the booklet "Haynes Stellite Products in the Oil Fields" has recently been published by Haynes Stellite Co., 205 E. 42nd St., New York. Procedure for hard facing and hard setting bits with Haystellite is described. Sections are devoted to Haynes Stellite J-Metal cutting tools and to corrosion-resistant Hastelloy.

HARD FACING The Linde Air Products Co., 205 E. 42nd St., New York, has published a folder "Steel Hard Facing Procedure." Detailed instructions for applying hard-facing material beginning with the preparation of the steel parts are included. Request bulletin F-3491 in ordering.

HEAT CONTROL "Heat" has been published by Johns-Manville, 22 E. 40th St., New York, N. Y. This 50-page book, profusely illustrated, discusses the fundamentals of heat and the problems of insulation. It is an excellent summary of contributions to the progress which industry is making in the more effective utilization of heat.

HEATERS A catalog which describes and illustrates the uses of the Lee direct fired unit heater has been prepared by the Dravo Corp., Machinery Division, Dravo Building, Pittsburgh, Pa. Included are descriptions of oil, natural gas, coke oven gas and coal fired heaters.

"IDEAL" PRODUCTS A catalog, Form No. B-737, offered by Ideal Commutator Dresser Co., 1439 Park Ave., Sycamore, Ill., illustrates and describes new and improved products.

INSERTED-BLADE TOOLS Bulletin No. 15-F, announced by McCrosky Tool Corp., 1345-85 S. Main St., Meadville, Pa., illustrates the design and action of "Jack-Lock" wedges for serrated-blade tools. Examples of special inserted-blade tools are shown.

INSTRUMENTS Graphic instruments manufactured by the Esterline-Angus Co., Indianapolis, Ind., are briefly described and illustrated in Form 1320, issued by the company.

INSULATION A four-page bulletin describes Spauldo, an insulation for motor slots, manufactured by the Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y.

JACKS A catalog describing its complete line of lifting jacks for mine, railroad and industrial use has been published by the Duff-Norton Mfg. Co., Pittsburgh, Pa.

LACQUER A summary giving the properties of "Blue Knight Roxyn C" air-drying or baking flexible lacquer with good resistance to chemicals has been prepared by Roxalin Flexible Lacquer Co., Inc., Elizabeth, N. J. Included are comparative test results with other materials. A four-page summary on the properties of "Cadmium Water Dipped Lacquer No. 3850" which is an air drying lacquer and prevents the oxidation, fuming or marring of cadmium plate is also available.

Small Hole Grinding

Mounted wheel held in chuck grinding small bore with spindle turning at 35,000 r.p.m.

RIVETT
No. 104
INTERNAL GRINDER

The Rivett No. 104 Grinder is designed to meet demand for a small hole grinder suitable for precision tool making and accurate manufacturing. It may be used as a single purpose machine in efficient production or readily and rapidly set up for the many varying requirements of the toolroom. Correct in proportion and design the extremely high spindle speeds necessary for small hole grinding can be maintained within the required limits absolutely free from vibration.

Although primarily an internal grinder, an external grinding attachment can replace the internal spindle bracket. The Rivett fixed diamond method is used for truing both internal and external wheels to maintain sizes on duplicate work. For further information write for bulletin 104-C.

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

LATHES Gisholt Machine Co., Madison, Wis., has prepared a catalog which completely covers the Gisholt improved 3AL, 4L and 5L heavy duty turret lathes and optional special attachments, mechanical and hydraulic chucks and standard tool sets that adapt the machines to individual requirements.

LIGHTING Handbook ML6 has been made available by the Fostoria Pressed Steel Corp., Fostoria, Ohio. It illustrates and gives specifications for the types of Fostoria Localites available and of their uses.

METAL FASTENING The "Shakeproof Engineer," a bulletin of technical information devoted to metal fastening methods, has been announced by Shakeproof Lock Washer Co., 2501 North Keeler Ave., Chicago. First bulletin of this series describes applications of thread-cutting screws and lock-washers.

METALS The latest edition of "Tables of Values of Iron, Steel, Wire & Metal Materials" includes data of prices from December, 1897, to July, 1937, inclusive, and may be secured from Oliver Bros., Inc., 421 Canal St., New York, N. Y.

MICROSCOPES Catalog D-15 published by Bausch & Lomb, Rochester, N. Y., fully describes the Greenough type binocular microscopes. Included are descriptions and prices of standard accessories.

MILLING CUTTTERS Lovejoy Tool Co., Inc., Springfield, Vt., has made available catalog No. 25 "Meeting Milling Cutter Requirements with Lovejoy Rotary Tool Holders." Various types of inserted blade milling cutters are described and priced, as well as arbors and special counterboring tools.

OIL COUNTY LATHES Bulletin No. 480-Q-737, offered by The Lodge & Shipley Machine Tool Co., Colerain, Cincinnati, Ohio, describes the 12½-in. hole-in-spindle, oil country lathes. Specifications are listed for the 24-, 27- and 30-in. lathes of this type.

OVENS A bulletin which illustrates batch type ovens and some of their typical applications in finishing departments has been prepared by Despatch Oven Co., 622 Ninth St. S.E., Minneapolis, Minn.

POWER TRANSMISSION— Dossier A-3 of the Baldwin-Duckworth Chain Corp., 1466 Main St., Springfield, Mass., describes the solution of a power transmission problem for hammer mills in Crime File style.

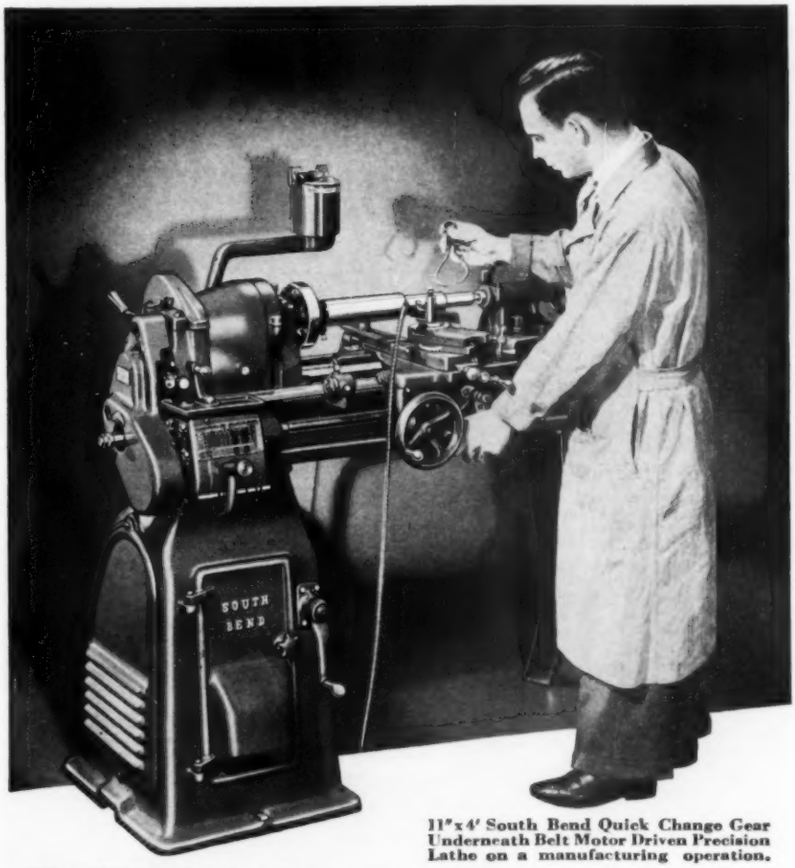
PRODUCTION TOOLS High speed single and multiple spindle drilling and tapping heads, die-heads and stud-setters are illustrated in a 4-page bulletin by Errington Mechanical Laboratory, Broadway and John St., New York.

PYROMETERS Indicating, recording and controlling devices which include the Brown Electr-O-Line Controllers and the Brown Proportioning Control System are illustrated and described in Catalog 1102. Address request to the Brown Instrument Co., Wawne & Roberts Aves., Philadelphia, Pa.

SANDING The new Sterling Speed-Bloc Sander is described in Sterling Products Co., 2457 Woodward Ave., Detroit, Bulletin 101. Included are descriptions of other Sterling products.

SAW BLADES Star hacksaw blades of all types are described in Catalog No. 51, Clemson Bros., Inc., Middletown, N. Y. Included are suggestions for the use of hacksaw blades.

SAWS A sixteen-page booklet on inserted tooth saws has just been issued by Pittsburgh Tool-Knife &



11"x4' South Bend Quick Change Gear Underneath Belt Motor Driven Precision Lathe on a manufacturing operation.

HUNDREDS of industries are using the new 11-inch South Bend Series "T" Lathes in their manufacturing plants, machine shops, and tool rooms for production jobs requiring power and rigidity, and for tool and gauge work requiring precision accuracy in doing the most exacting jobs. Fine workmanship combined with new features and design insure handling the most precise industrial operations with speed, accuracy, and versatility.

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68 Sizes and Types of Lathes for every purpose.

9" lathe prices start at $287
11" lathe prices start at $371
13" lathe prices start at $448
15" lathe prices start at $544
16" lathe prices start at $642

Write FOR BULLETIN

Bulletin No. 11-C illustrates, describes and prices the different models of the 11-inch lathe. Copy sent free, upon request.

SOUTH BEND *Precision* LATHES
MODERN LATHES FOR MODERN INDUSTRY

Mfg. Co., Pittsburg, Pa. Booklet outlines available tooth sizes and gives specifications, standard dimensions and list prices.

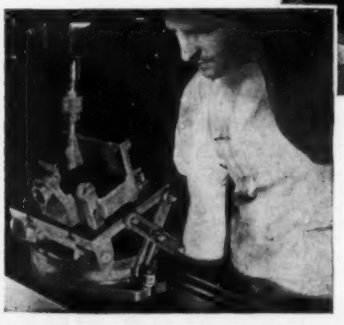
SELF-LOCKING THREADS The use of Dardelet threads on cap and set screws is described in Bulletin No. 17 of the Dardelet Threadlock Corp., 55 Liberty St., New York, N. Y.

SHIMS A convenient specifications file folder has been issued by the Laminated Shim Co., Long Island City, N. Y. It presents detailed specifications of laminated brass shim stock including materials, their composition and degree of lamination, stock size and other items.

SPOT WELDING Two bulletins Nos. 501 and 502 covering the line of foot operated and automatically operated Type "R" spot welders, respectively, of the Federal Machine & Welder Co., 212 Dana St., Warren, Ohio, have been issued. They contain information regarding the Kva capacity, gages of stock to be handled and operating speeds.

PLANING A MACHINE TOOL COLUMN in the Planer Dept., division of Heavy Mfg. Dept. Complete equipment for job work — planers, boring mills, heavy turret lathes, radials, etc.

ANOTHER TAFT-PEIRCE TOOLROOM JOB—Boring an aircraft fixture to a tenth with the T-P adjustable boring head.



SETTING COMPOUND ANGLES is simplified by the Taft-Peirce Adjustable Angle Plate—a leading item in the complete T-P line of standardized toolroom specialties.

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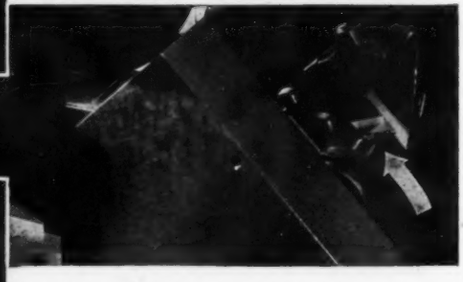
LINE OF LATHES in "world's most famous toolroom" (open to you), scene of contributions to development of motors, typewriters, sewing machines, and other world-revolutionizing inventions.



DONE WITH MIRRORS. Ingenuity in a difficult set-up. Mirror enables operator to see wheel. Arrow points to reflection of tool. Grinding Dept. does all job work, hardened and ground parts.

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WOONSOCKET, R. I.

Take it to TAFT-PEIRCE for Contract Manufacture, Design, Tooling, Gages, Set-Up and Inspection Tools

SPRING WASHERS National Lock Washer Co., Newark, N. J. has published a standard spring washer data wall chart, 12½ in. x 18 in. It contains the recommended standard sizes, manufacturing tolerances and sections in complete but concise form that will be helpful to all users of spring washers.

STAINLESS STEEL "The working of Silcrome Stainless Steel" has been published by Ludlum Steel Co., Watervliet, N. Y., and gives detailed instructions on methods of fabricating Ludlum stainless with information as to the grades of tool steel best suited to each operation.

SWITCHES A 4-page bulletin describing the new Super-sensitive line voltage switch has been made available by the National Acme Co., Cleveland, Ohio. The several forms in which this switch can be used are illustrated.

SWITCHES A twelve-page catalog describing the complete line of G.E. Konnector Mercury Switches features twelve full-size illustrations of the common types of mercury-to-mercury and mercury-to-metal switches. Catalog 603 includes a table of capacities and electrical specifications for each type.

TINT-METAL A four-page folder on "Tint-Metal" (Bright Metal in Colors) has been prepared by American Nickeloid Co., Peru, Ill. Samples of the brightly colored metals are included.

TOOLS A folder showing many different standard Firthite tip designs in actual size, standard Firthite tools and a number of non-standard tools and tips, includes engineering information and prices. Folder may be secured from Firth-Sterling Steel Co., McKeesport, Pa.

UNEMPLOYMENT No. 23 in a series of booklets-editorials by Allen W. Rucker in collaboration with N. W. Pickering, president, Farrel-Birmingham Co., Inc., Ansonia, Conn. has been prepared on "What Can Industry Do About Unemployment?" The booklet on the basis of reliable statistics presents a possible solution of the unemployment problem. Single copies may be obtained free from the company.

WELDERS Catalog 38W published by Eisler Engineering Co., 750 So. 13th St., Newark, N. J., contains latest information on Eisler welding machines, including accessories.